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## Universal Outdoor Modem Installation and Operation Manual

Comtech EF Data is an  
AS9100 Rev B / ISO9001:2000  
Registered Company



**IMPORTANT NOTE:** The information contained in this document supersedes all previously published information regarding this product. This manual is subject to change without prior notice.





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## Universal Outdoor Modem Installation and Operation Manual

Comtech EF Data is an  
AS9100 Rev B / ISO9001:2000  
Registered Company



Part Number MN-OM20  
Revision 5  
October 27, 2009

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# PREFACE

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## About this Manual

This manual describes the installation and operation for the Radyne OM20. This is a technical document intended for earth station engineers, technicians, and operators responsible for the operation and maintenance of the OM20.

## Reporting Comments or Suggestions Concerning this Manual

Comments and suggestions regarding the content and design of this manual are appreciated. To submit comments, please contact the Comtech EF Data Technical Publications department:

[TechnicalPublications@comtechefdata.com](mailto:TechnicalPublications@comtechefdata.com)

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## Conventions and References

### Related Documents

The following documents are referenced in this manual:

- EN300-421 and EN301-210 ETSI
- ETSI EN302-307

### Metric Conversion

Metric conversion information is located on the inside back cover of this manual. This information is provided to assist the operator in cross-referencing non-Metric to Metric conversions.

## Cautions and Warnings



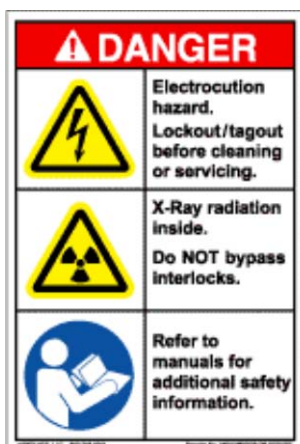
**IMPORTANT** or **NOTE** indicates a statement associated with the task being performed or information critical for proper equipment function.



**CAUTION** indicates a hazardous situation that, if not avoided, may result in minor or moderate injury. CAUTION may also be used to indicate other unsafe practices or risks of property damage.



**WARNING** indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury.



Examples of  
Multi-Hazard Formats

## Trademarks

Product names mentioned in this manual may be trademarks or registered trademarks of their respective companies and are hereby acknowledged.


## Safety Compliance

### EN 60950


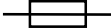
Applicable testing is routinely performed as a condition of manufacturing on all units to ensure compliance with safety requirements of EN60950. This equipment meets the Safety of Information Technology Equipment specification as defined in EN60950.



### Low Voltage Directive (LVD)

The following information is applicable for the European Low Voltage Directive (EN60950):

<HAR>	Type of power cord required for use in the European Community.
	<b>CAUTION:</b> Double-pole/Neutral Fusing <b>ACHTUNG:</b> Zweipolige bzw. Neutralleiter-Sicherung

International Symbols:

Symbol	Definition
	Alternating Current
	Fuse

Symbol	Definition
	Protective Earth / Safety Ground
	Chassis Ground



NOTE

***For additional symbols, refer to Cautions and Warnings, listed earlier in this Preface.***

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## Warranty Policy

Comtech EF Data products are warranted against defects in material and workmanship for a period of two years from the date of shipment. During the warranty period, Comtech EF Data will, at its option, repair or replace products that prove to be defective. Repairs are warranted for the remainder of the original two year warranty, or a 90 day extended warranty, whichever is longer.

For equipment under warranty, the owner is responsible for freight to Comtech EF Data and all related customs, taxes, tariffs, insurance, etc. Comtech EF Data is responsible for the freight charges only for return of the equipment from the factory to the owner. Comtech EF Data will return the equipment by the same method (i.e., Air, Express, Surface) as the equipment was sent to Comtech EF Data.

All equipment returned for warranty repair must have a valid RMA number issued prior to return and be marked clearly on the return packaging. Comtech EF Data strongly recommends all equipment be returned in its original packaging.

Comtech EF Data Corporation's obligations under this warranty are limited to repair or replacement of failed parts, and the return shipment to the buyer of the repaired or replaced parts.

## Limitations of Warranty

The warranty does not apply to any part of a product that has been installed, altered, repaired, or misused in any way that, in the opinion of Comtech EF Data Corporation, would affect the reliability or detracts from the performance of any part of the product, or is damaged as the result of use in a way or with equipment that had not been previously approved by Comtech EF Data Corporation.

The warranty does not apply to any product or parts thereof where the serial number or the serial number of any of its parts has been altered, defaced, or removed.

The warranty does not cover damage or loss incurred in transportation of the product.

The warranty does not cover replacement or repair necessitated by loss or damage from any cause beyond the control of Comtech EF Data Corporation, such as lightning or other natural and weather related events or wartime environments.

The warranty does not cover any labor involved in the removal and or reinstallation of warranted equipment or parts on site, or any labor required to diagnose the necessity for repair or replacement.

The warranty excludes any responsibility by Comtech EF Data Corporation for incidental or consequential damages arising from the use of the equipment or products, or for any inability to use them either separate from or in combination with any other equipment or products.

A fixed charge established for each product will be imposed for all equipment returned for warranty repair where Comtech EF Data Corporation cannot identify the cause of the reported failure.

## **Exclusive Remedies**

Comtech EF Data Corporation's warranty, as stated is in lieu of all other warranties, expressed, implied, or statutory, including those of merchantability and fitness for a particular purpose. The buyer shall pass on to any purchaser, lessee, or other user of Comtech EF Data Corporation's products, the aforementioned warranty, and shall indemnify and hold harmless Comtech EF Data Corporation from any claims or liability of such purchaser, lessee, or user based upon allegations that the buyer, its agents, or employees have made additional warranties or representations as to product preference or use.

The remedies provided herein are the buyer's sole and exclusive remedies. Comtech EF Data shall not be liable for any direct, indirect, special, incidental, or consequential damages, whether based on contract, tort, or any other legal theory.

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## Customer Support

Contact the Comtech EF Data Customer Support Department for:

- Product support or training
- Reporting comments or suggestions concerning manuals
- Information on upgrading or returning a product

A Customer Support representative may be reached at:

Comtech EF Data  
Attention: Customer Support Department  
2114 West 7th Street  
Tempe, Arizona 85281 USA  
480.333.2200 (Main Comtech EF Data number)  
480.333.4357 (Customer Support Desk)  
480.333.2161 FAX

To return a Comtech EF Data product (in-warranty and out-of-warranty) for repair or replacement:

- **Contact** the Comtech EF Data Customer Support Department. Be prepared to supply the Customer Support representative with the model number, serial number, and a description of the problem.
- **Request** a Return Material Authorization (RMA) number from the Comtech EF Data Customer Support representative.
- **Pack** the product in its original shipping carton/packaging to ensure that the product is not damaged during shipping.
- **Ship** the product back to Comtech EF Data. (Shipping charges should be prepaid.)

## Online Customer Support

An **RMA number request** can be requested electronically by contacting the Customer Support Department through the online support page at **[www.comtechefdata.com/support.asp](http://www.comtechefdata.com/support.asp)**:

- **Click** on the “Service” hyperlink, then read the “Return Material Authorization” section for detailed instructions on our return procedures.
- **Click** on the “RMA Request Form” hyperlink, then fill out the form completely before sending.
- **Send e-mail** to the Customer Support Department at **[service@comtechefdata.com](mailto:service@comtechefdata.com)**.

For information regarding this product’s warranty policy, refer to the Warranty Policy, p. xxii.



# Chapter 1. Introduction

This chapter provides an overview of the OM20 Outdoor Modem. The OM20 system can support a C-Band with power levels of 2, 5 and 10 watts or Ku-Band with output powers of 2, 4 and 8 watts.



**Figure 1.1. Outdoor Modem (OM20) without protective shroud**

## 1.0 Overview

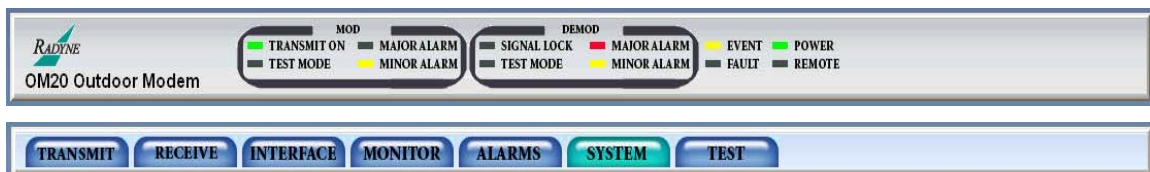
Radyne's OM20 outdoor modem is based on Radyne's DMD20/LBST modem product platform. The Transmit IF output and Receive IF input frequencies of the OM20 are 950 to 2050 MHz. The modem operates over a data rate range of 2.4 Kbps to 20 Mbps in 1 bps steps including at all standard IBS and IDR Data rates up to 8.448 Mbps. A full range of Industry Standard Data Interfaces is available for the OM20. Interface types are selectable from EIA-530 (J3), Ethernet (J4), optional ITU G.703 (Unbalanced on J10/11, Balanced on J3), and an optional ASI (J10/11). The OM20 is available with optional feed mounted C or Ku-Band LNB's for the downlink, and optional feed mounted 2/4/8 Watt Ku-Band or 5/10 Watt C-Band BUC's for the uplink.

The OM20 supplies DC voltage and 10 MHz reference to the BUC and LNB via the IF Cables. The output from the TX Port (J8) consists of the L-Band output frequency, high-stability 10 MHz reference, and an optional 24 or 48 Volts to the BUC. The RX Port I/O (J7) consists of the L-Band input frequency (from the LNB), high-stability 10 MHz reference and 13, 15, 18, and 21 volts. The OM20 has the capability to enable and disable the BUC/LNB voltages and 10 MHz reference.

In addition, monitoring features provide verification of BUC and LNB status. The OM20 monitors both the current and the voltage at the output of the TX and RX Ports, thus allowing the user to monitor the operating status of BUC and LNB.

Redundancy for the OM20 is supported by the OMS11, Outdoor Modem Switch. OMS11 offers redundancy for Data and supplies power for switching TX and RX Waveguide switches. For additional information, refer to TM133 OMS11 Operational Manual.

Radyne's OM20 Ethernet Graphical User Interface (GUI) offers browser based control of the OM20, BUC, and LNB with numerous user-friendly GUI programmable functions (see Figure 1-2). The OM20 GUI provides selectable functions for different services: Intelsat IDR and IBS, as well as closed networks. All of the configuration and Monitor and Control (M&C) functions are available using the GUI (Ethernet J4) or is also available using the conventional RS-232/485 terminal port (J2). Operating parameters, such as variable data rates, FEC Code Rate, modulation type, IF Frequencies, IBS/IDR Framing, and interface type can be readily set and changed by earth station operations personnel, using either the GUI or terminal interfaces.



**Figure 1-2. OM20 Outdoor Modem Upper GUI Screen**

## 1.1 OM20 Configurations

The OM20 can be configured in the following different ways:

- Features and options are installed as specified when the unit is ordered from the factory,
- Optional software feature upgrades in the future while deployed in the field,
- Future hardware options can be installed to a unit that is sent back to a Radyne facility.

### 1.1.1 Features/Options Installed at Time of Order

Features installed at the time of ordering are the options pre-installed/initialized in the factory prior to shipment. Features and options can be reviewed from the GUI or remote port of the OM20. [Refer to Section 4, “User Interfaces”](#) for information on how to view these features. Factory installed options are chassis and board configurations that are introduced during manufacture. These options include (Options are subject to change):

- Input Power: AC 2-5 W BUC (24VDC), AC 8-10W BUC (48 VDC),
- Input Power: DC 2-5 W BUC (24VDC), DC 8-10W BUC (48 VDC)
- Data Rate: 5 Mbps (standard), optional 10, 20 Mbps
- Interface: EIA-530 (standard), Optional Ethernet, G.703, ASI
- M&C Interface – SNMP Ethernet/Web Browser – RS485, RS232
- Viterbi Codec (standard), Optional Sequential Codec
- Optional Custom Reed Solomon
- Optional IBS, IDR, Drop and Insert
- Optional External Reference Input Connector
- Modulation: BPSK, QPSK, OQPSK (standard), Optional 8PSK, 16 QAM
- Optional Turbo, 5Mbps, 20Mbps
- Sequential Codec, and custom programmable Reed Solomon.
- Optional OM73
- Optional DVB
- Optional Cable, Waveguide, Mounting Kits
- M&C Interface – SNMP, Ethernet/Web Browser, RS485, RS232

### 1.1.2 Software Feature Upgrades

Software Feature Upgrades are a simple and quick way of changing the feature set of an installed modem. Feature upgrades are how most OM20 options are implemented. Features may be purchased at any time by contacting a Radyne Corp. salesperson. Refer to Appendix B for information on how upgrade features.

### 1.1.3 Future Hardware Options

Hardware options ([Refer to Appendix A](#)) are purchased parts that can only be installed at a Comtech Facility. Please contact the Comtech EF Data Customer Service Department for information not limited to availability and to shipping costs.



***Only authorized service personnel should handle and install optional hardware options.***

**Notes:**

[illegible]

# Chapter 2. Installation

This document provides unpacking and installation instructions, and a description of external connections.

---

## 2.1 Installation Requirements

The OM20 is designed to be easily installed on antenna offset feed struts or king posts. It requires standard uni-strut type hardware (or comparable) and 3/8-16 bolts. Standard mounting brackets and hardware are included with the OM20. Optional Transmit and Receive coaxial cable or waveguide can be provided from the factory if requested and specified. If installing the OMS11 redundancy switch with the OM20, refer to the operational manual, TM133 Outdoor Modem Switch for mounting requirements. Mating Connectors for Power (J1), Remote RS232/485/Fault (J2), EIA-530/G703 Balanced data (J3), and Ethernet (J4) interface connections are supplied standard with the unit. Use of an extended temperature CAT-5 cable such as Belden 7923A is recommended for the Ethernet Data/M&C interface.



*There are no user-serviceable parts or configuration settings located inside the OM20 Chassis. There is a potential shock hazard internally at the power supply modules. DO NOT open the OM20 Chassis under any circumstances.*



*Before initially applying power to the unit, it is a good idea to disconnect the transmit output from the operating ground station equipment and terminate it into an applicable load. This is especially true if the current OM20 configuration settings are unknown, where incorrect settings could disrupt existing communications traffic.*



*The OM20 contains a Lithium Battery. **DANGER OF EXPLOSION** exists if the battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries in accordance with local and national regulations.*

## 2.2 Unpacking

### 2.2.1 Outdoor Modem (OM20)

The OM20 Universal Outdoor Modem is carefully packaged at the factory to avoid damage and should arrive complete with the following items for proper installation:

- OM20 Universal Outdoor Modem
- Power Mating connector (J1)
- Mating Ethernet connector (J4)
- Mating connectors for 18 pin (J2 M&C)
- 38 pin (J3 EIA-530) connectors
- Installation Brackets
- OM20 Manual on CD
- Default Plug (J2)

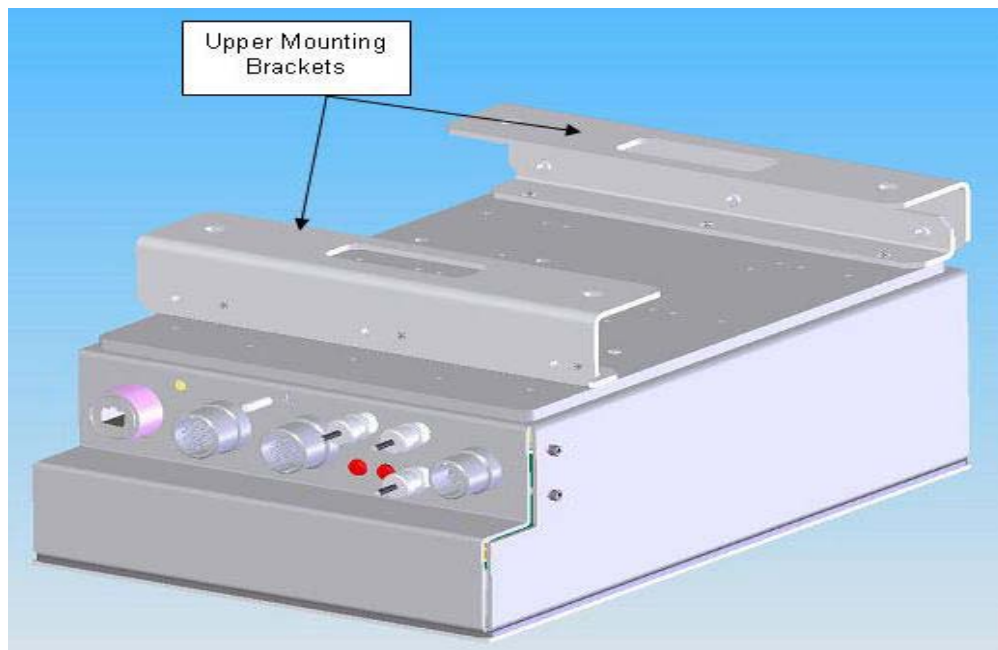


Figure 2.1. OM20 with protective shroud

## 2.3 Removal and Assembly

The Standard OM20 is shipped in a single box that contains mating connectors. Carefully unpack the unit and ensure that all of the above items are in the carton. The standard OM20 power supply is designed for universal AC (95-250VAC, 50/60 Hz) application and is capable of supplying DC power to the BUC and LNB. See the specification section of this document for appropriate voltages and currents. Optionally, a -48VDC power supply may be specified for the unit.

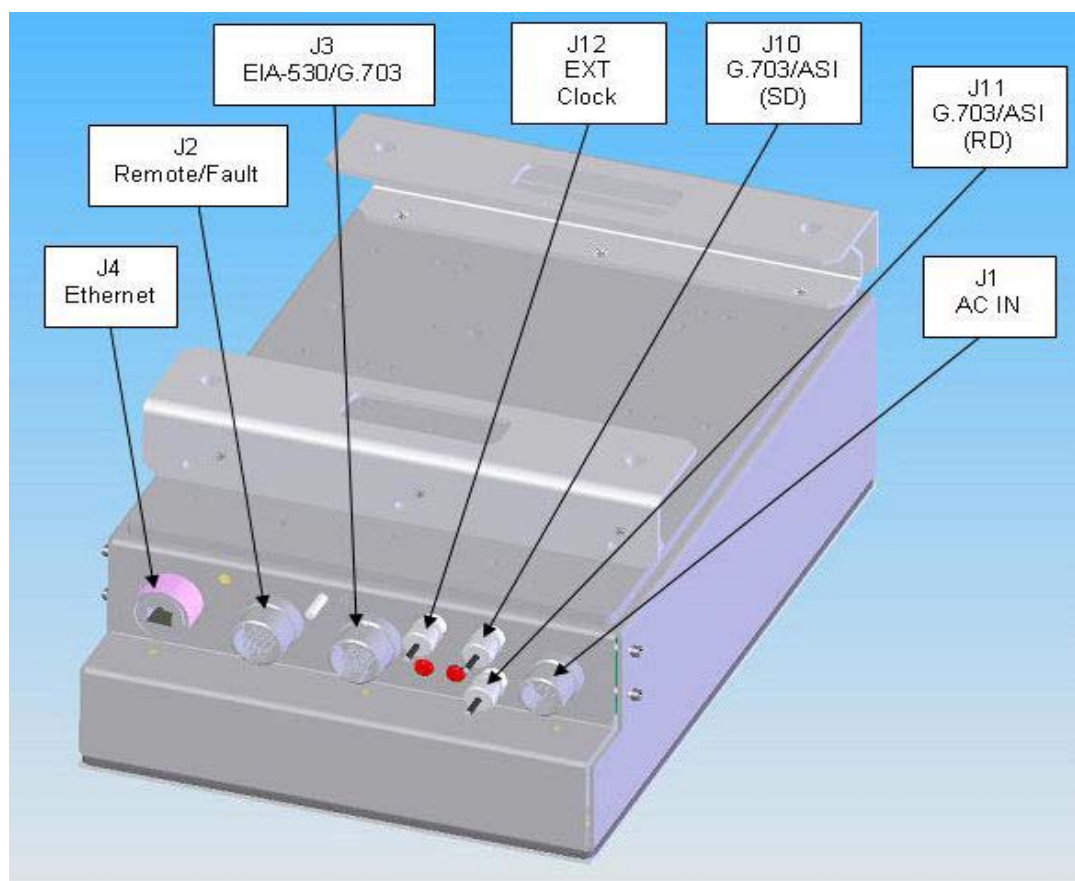
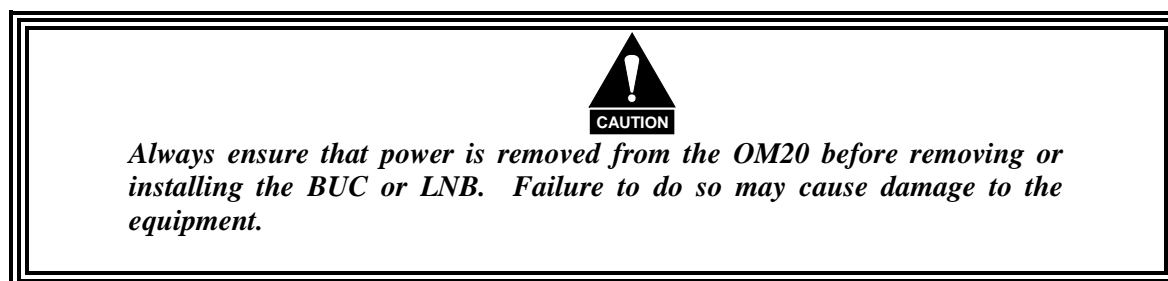


Figure 2.2. OM 20 Front Interconnects

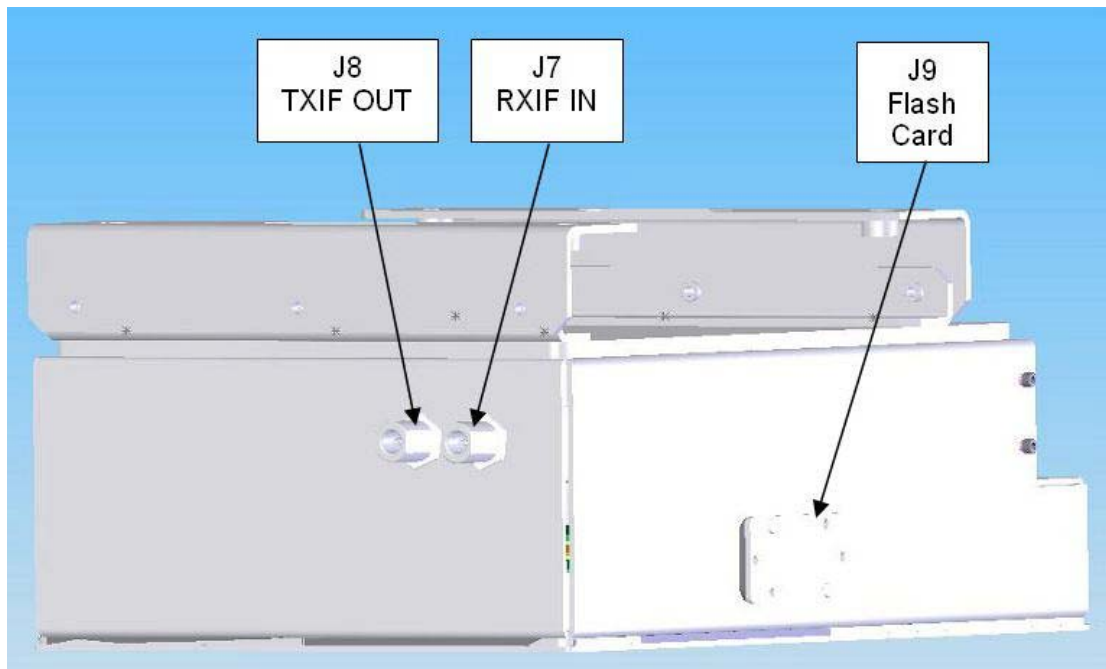


Figure 2.2a. OM 20 Rear Interconnects (cont)

## 2.4 Mounting and Wiring Considerations

The OM20 should be mounted with the BUC higher than the OM20 with the interconnecting communication cabling and power cords at the lowest possible position. Unit weight and cable/waveguide length should be considered when selecting the mounting location.

The following diagrams should be used as a reference to the various mounting options. The OM20 should not be placed immediately above a high-heat or EMI (Electro-Magnetic Interference) source to ensure the output signal integrity and proper receive operation. Figures 2-3 through 2-11 illustrate the different interconnect and data interface configurations for the OM20.

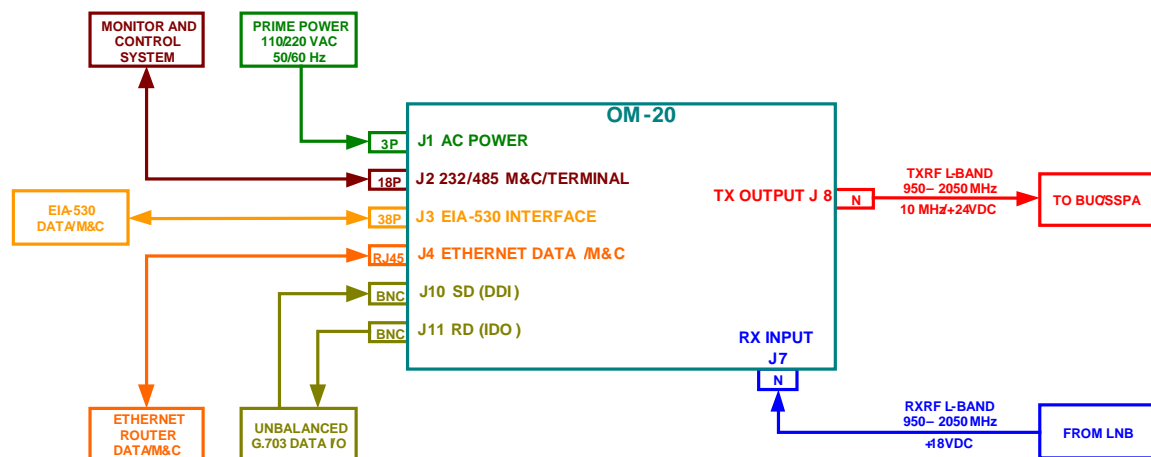


Figure 2-3. Outdoor Modem (OM) Interconnect Diagram



### 2.4.1 OM20 Mounting Bracket Instructions

Mount the OM20 to the desired location at the antenna using the supplied brackets. Each brackets has two threaded holes 3/8 x 16 as shown in Figure 2-4 below.

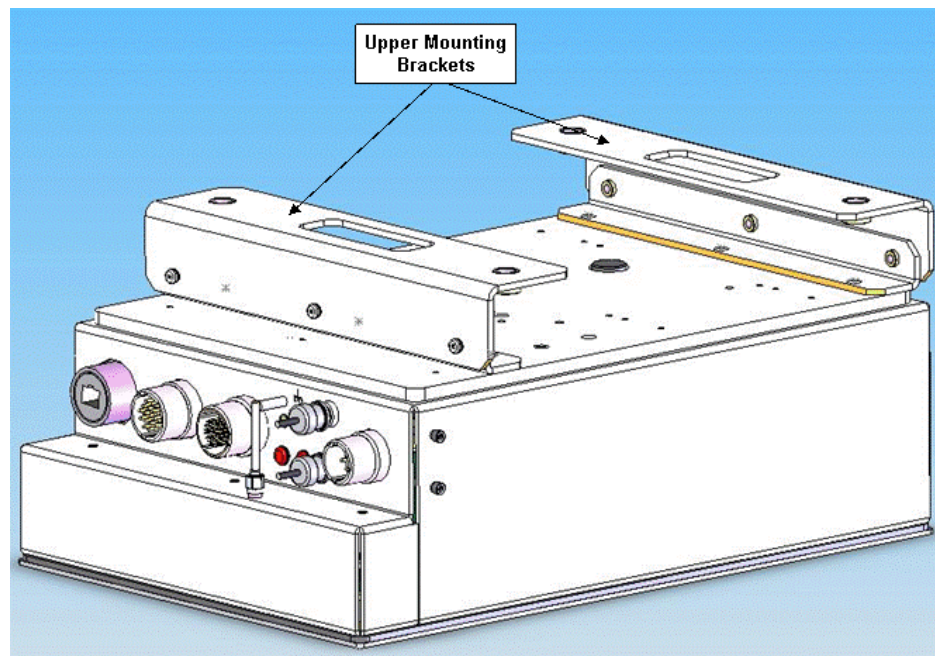


Figure 2.4. OM20 Mounting Brackets

## 2.4.2 OM20 General Antenna Post Mount Diagram

The OM20 and BUC can be mounted vertically on the antenna King post. This is the preferred method of mounting on smaller diameter antenna systems where sufficient support of the feed boom arm is not available.

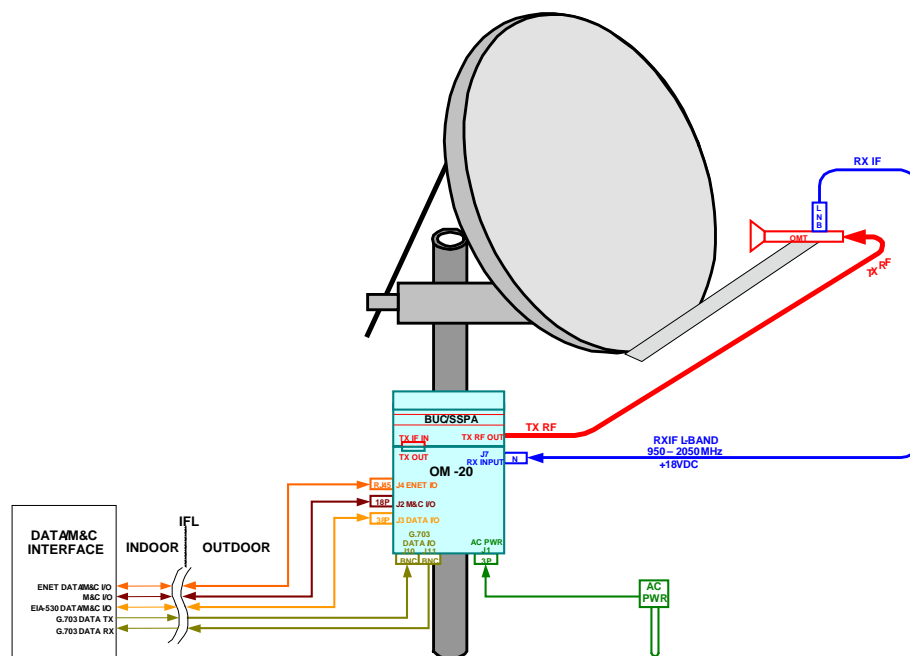


Figure 2-5. OM20 Antenna Post Mount

### 2.4.3 OM20 General Antenna Post Mount Diagram

The OM20 can be mounted on the antenna King post and the BUC on the offset feed arm. System is shown with the Ethernet interface allowing for Data and M&C functions.

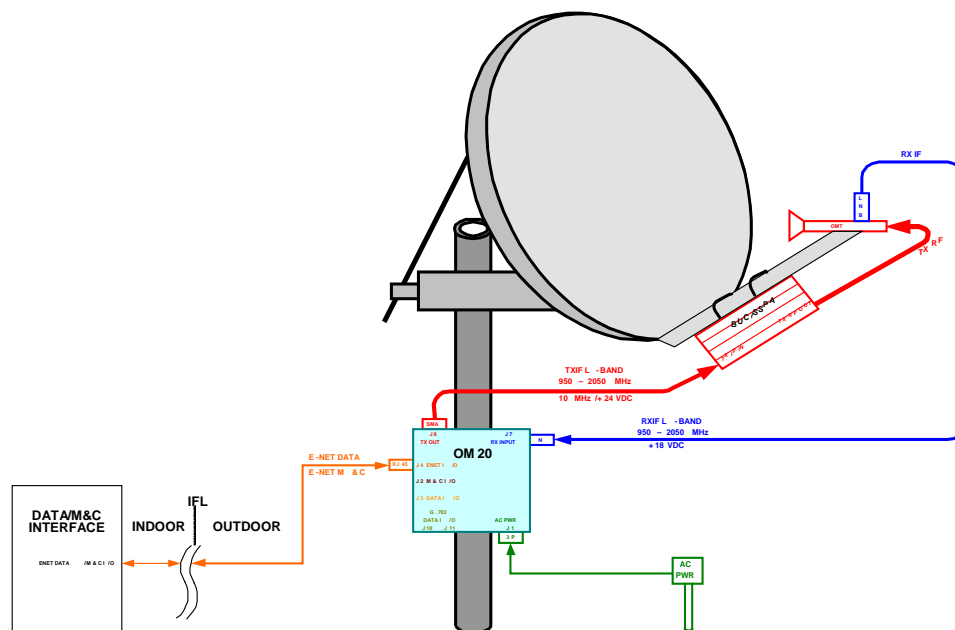
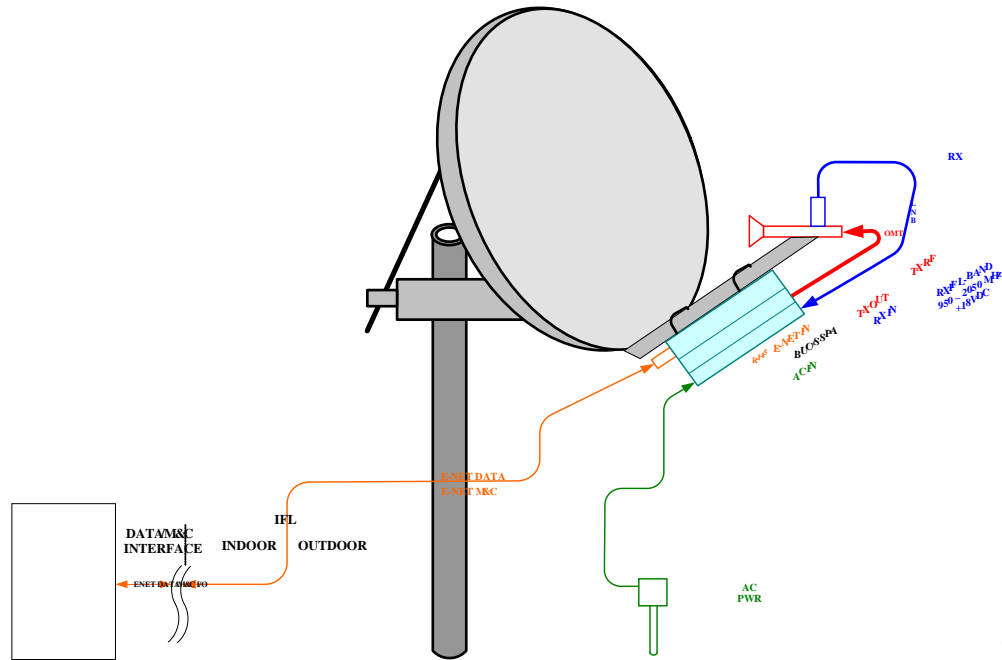


Figure 2-6. OM20 Antenna Post Mount, BUC Feed Arm Mount, Ethernet Interface

#### 2.4.4 OM20 Antenna Feed Arm Mount Diagram

The OM20 can be mounted horizontally on the Antenna Feed arm. This is the preferred method of mounting on larger diameter antenna systems where sufficient support and weight handling characteristics of the antenna offset feed arm is available.



**Figure 2-7. OM20 Feed Arm Mount, Ethernet Interface**

### 2.4.5 OM20 with External TWTA Amplifier

The OM20 can be used as a driver for an external SSPA/TWTA High Power Amplifier for systems requiring higher output RF Power Levels.

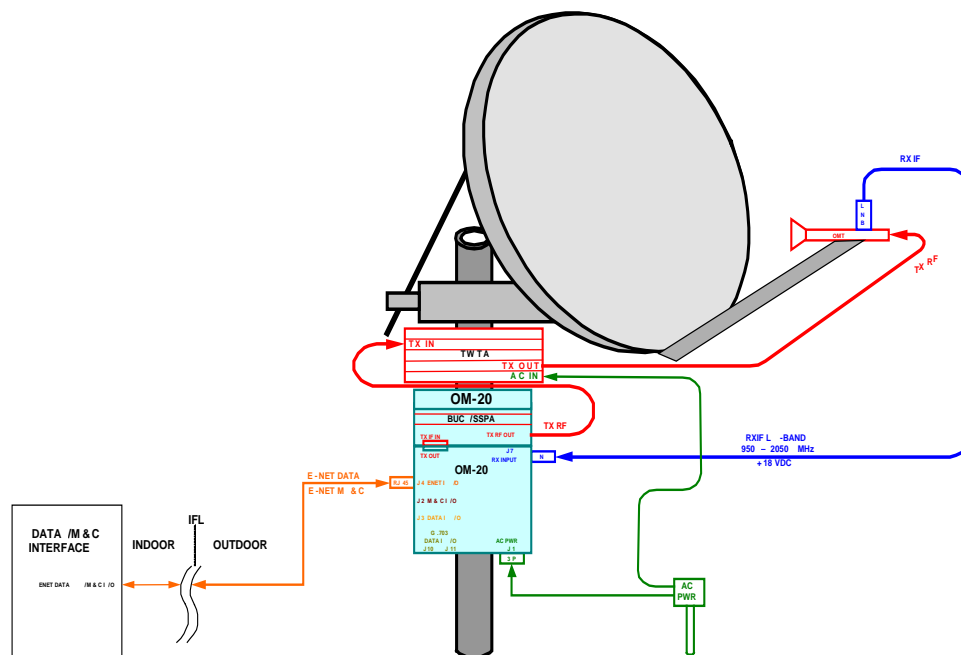


Figure 2-8. OM20 with High Power Amplifier, Ethernet Interface

## 2.4.6 OM20 Additional Interface Diagrams

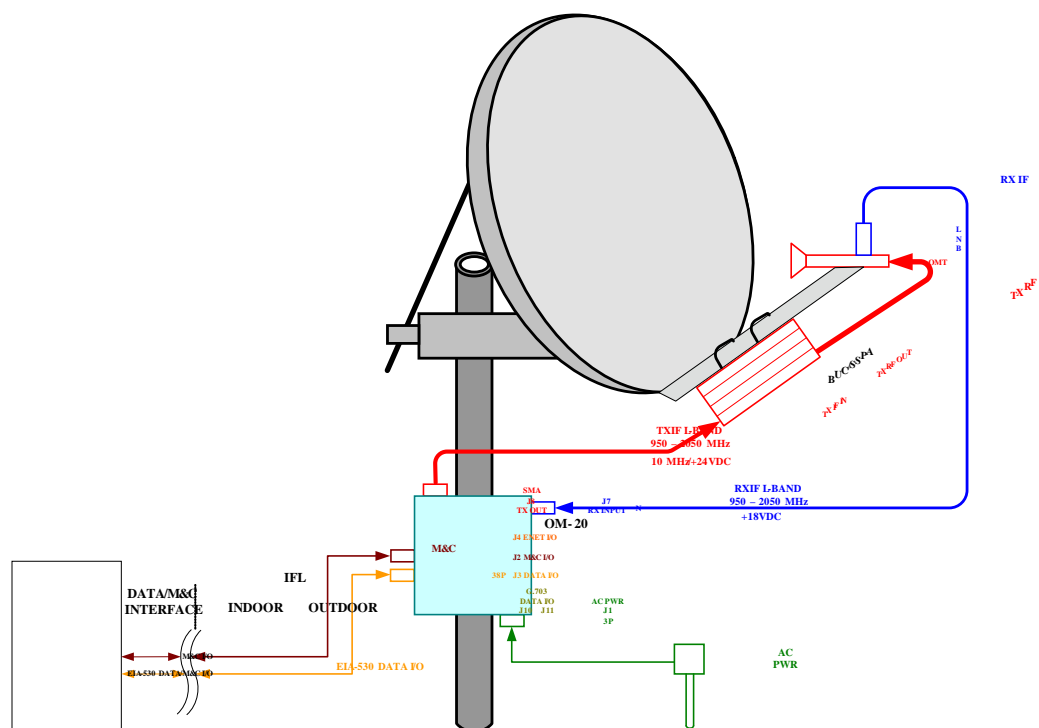


Figure 2-9. OM20 EIA-530 Interface

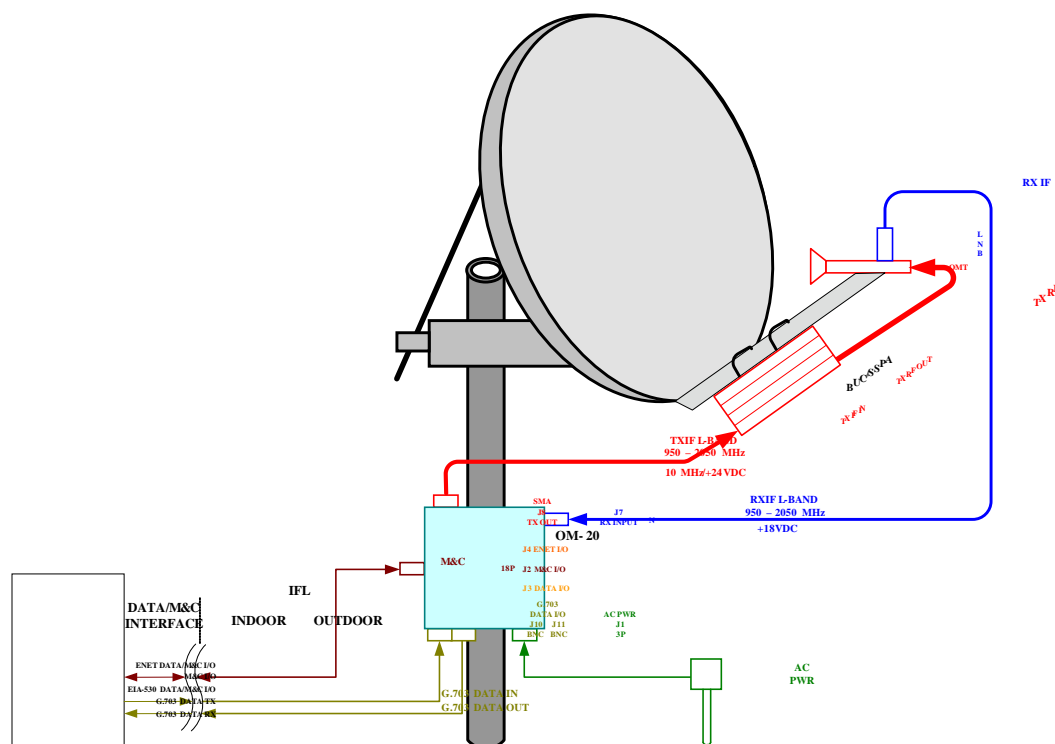
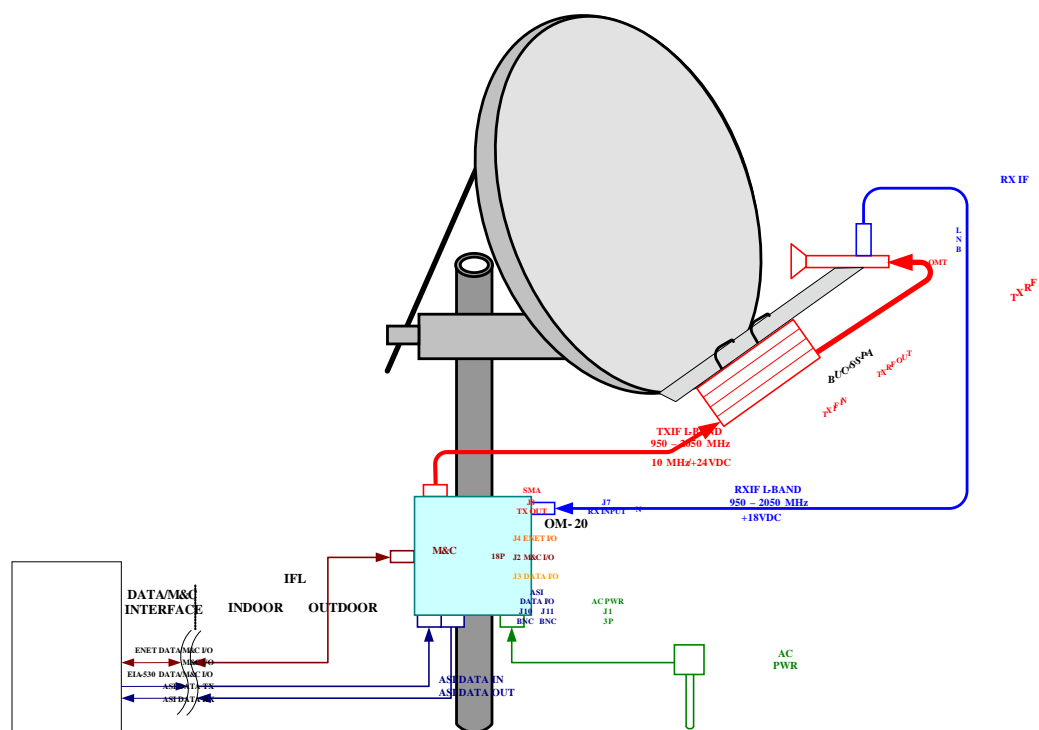


Figure 2-10. OM20 G.703 Interface



**Figure 2-11. OM20 ASI Interface**

**Notes:**

[illegible]



# Chapter 3. OM20 Initial Configuration

## 3.1 OM20 Initial Configuration Check

The OM20 is shipped from the factory with preset factory defaults. Upon initial power-up, a user check should be performed to verify the shipped modem configuration.



*The correct OM20 Interface Type (V.35, RS-422, RS-232, G.703, etc.) **MUST** be selected **BEFORE** the mating connectors are installed. Failure to do so may cause damage to the OM20. Power up the OM20, select the appropriate interface type, and then install the data mating connector.*



*Implementing Strap Code 26 can set the following modem configuration. Refer to Table G-1 in Appendix G for an explanation and tabular listing of available Strap Codes. The Frequency and Modulator Output Power are set independently of the strap code.*

## Standard OM20 Factory Default Configuration Settings

### Modulator:

Data Rate:	2.048 Mbps
Mode:	Closed Network
Satellite Framing:	None
Scrambler:	V.35 (IESS)
Drop and Insert:	Disabled
Inner FEC:	1/2 Rate Viterbi
Outer FEC:	Disabled
Modulation:	QPSK
Frequency:	1350 MHz
Modulator Output Power:	-20 dBm

### Demodulator:

Data Rate:	2.048 Mbps
Mode:	Closed Network
Satellite Framing:	None
Descrambler:	V.35 (IESS)
Drop and Insert:	Disabled
Inner FEC:	1/2 Rate Viterbi
Outer FEC:	Disabled
Modulation:	QPSK
Frequency:	1350 MHz

### Interface:

The default will vary depending on the interface type

### Ethernet:

IP Address Mask:	255.000.000.000
Modem IP Address:	010.000.000.001
Server IP Address:	010.001.001.001
Router IP Address:	010.000.001.001



IMPORTANT

#### IP M&C Default Reset

*If the unit should lockup or lose communication during the initialization process, the unit remote interface can be reset using the supplied reset mating connector. By installing the connector on J2 and cycling power, the unit communication parameters will be reset to the factory test settings. Refer to section D for Quick Set-Up Guide*

To lock up the modem with an internal loopback feature, enter 'IF Loopback Enable' under the Test Menu.

## 3.2 Initial Configuration and Setup Process

The following descriptions assume that the OM20 is installed in a suitable location with prime AC power and supporting equipment available.



*Before initial power up of the OM20, it is a good idea to disconnect the transmit output from the operating ground station equipment and terminate the port into a properly sized load. This is especially true if the current Modulator Configuration Settings are unknown, where incorrect settings could disrupt the existing communications traffic. New units from the factory are normally shipped in a default configuration which includes setting the transmit carrier off.*

### 3.2.1 Initial Power-Up and Configuration Verification

Turn on the unit by connecting the power cable to J1 of the OM20 and plugging the power cord into the appropriate AC Mains power source. Upon initial and subsequent power-ups, the OM20 Microprocessor will test itself and several of its components before beginning its Main Monitor/Control Prog. Upon successful completion of the powerup, the LED's on the front of the unit will be Green. If a failure is detected, the Fault LED will illuminate on the web browser interface and on the front Status LED.

### 3.2.2 M&C Setup (IP Configuration & RS232 Interface)

Connect an Ethernet cable between the unit and a computer that has web browser capability. Access the browser and enter the default web address for the unit. Refer to [Section 6](#) for a complete description of the GUI Interface operation and parameters. The factory set defaults for the Ethernet port Browser are:

IP Address Mask:	255.000.000.000
Modem IP Address:	010.000.000.001
Server IP Address:	010.001.001.001
Router IP Address:	010.000.001.001

The initial field checkout of the modem can also be accomplished from the Terminal Mode. The Terminal Mode has the advantage of providing full screen access to all of the modem's parameters, but requires a separate terminal or computer running a Terminal Program such as Hyper-terminal and connection to the applicable pins on the unit M&C connector J2. The recommended terminal setup is as follows (These settings can be changed via the Web Browser):

Emulation Type:	VT-100
Baud Rate:	19.2 K
Data Bits:	8
Parity:	No Parity (Fixed)

**IMPORTANT**

### **Resetting IP Address & Terminal to Default/Reset Mode**

*If the unit should lockup or lose communication during the initialization process, the unit remote interface can be reset using the supplied reset mating connector. By installing the connector on J2 and cycling power, the unit communication parameters will be reset to the factory test settings. Refer to Section D for Quick Set-Up Guide.*

## **3.3 OM20 Verification Testing**

This Section assumes that the operator of the OM20 has sufficient knowledge of satellite system operation to perform the verification tests. The use and/or tuning of the associated antenna should be conducted in a safe manor and per the antenna manufactures guidelines. Precautions should be taken as to not damage the OM20 and/or test/operational equipment that are connected together. The brief testing described below is to verify the OM20 operation and does not constitute operational testing over the Satellite. Refer to the Satellite Providers system requirements and contact the Satellite Provider prior to radiating the system on any satellite. Ensure that all operational parameters are correctly set to the system specification in the OM20. Refer to [Section 4](#) of this document for further information on the OM20 Setup parameters.

### **3.3.1 TX Output Verification Test**

Connect a Spectrum Analyzer to the TXRF output of the OM20. Verify that the modulator and TX interface parameters of the OM20 are correctly set. Enable the modulator output. Verify that the output frequency, symbol rate, and power level match the system setup parameters.



**DC Voltage and/or High microwave energy may be present on the output connector.**

### 3.3.2 RX Input Verification Test

Connect a Spectrum Analyzer and Bias-T to the RXRF L-Band Output of the LNB. Ensure that the Antenna is correctly tuned and that the carrier of interest is visible and that the frequency and power level is correct. Verify that all the receive parameters of the OM20 are correct. Remove the LNB coax cable from the Bias-T and connect to the RX L-Band input port J7 on the OM20. Enable the correct DC Bias Voltage for the LNB from the OM20 Browser. Verify that the OM20 receiver locks to the carrier of interest.



*DC Voltage may be present on the output connector.*

### 3.4 Storage and Reshipment

It is recommended that the unit be stored or reshipped in its original sealed packing. The unit should be stored in a dry location where the temperature is stable, away from direct contact with rain, snow, wind, sun, or anything that may cause damage.

[illegible]

# Chapter 4. OM20 Theory of Operation

## 4.1 OM20 Hardware

The OM20 Outdoor Modem is based on the DMD20 Modem product platform that consists of a two printed circuit card (minimum configuration) design with additional optioned printed circuit cards available for additional features. The minimum configuration consists of an L-Band/IF Assembly and a Digital Baseband Assembly. The optional printed circuit cards include a Turbo Codec printed circuit card and one of several types of Interface printed circuit card ([Refer to Appendix A](#)). A block diagram of the OM20 is shown in Figure 4.1.

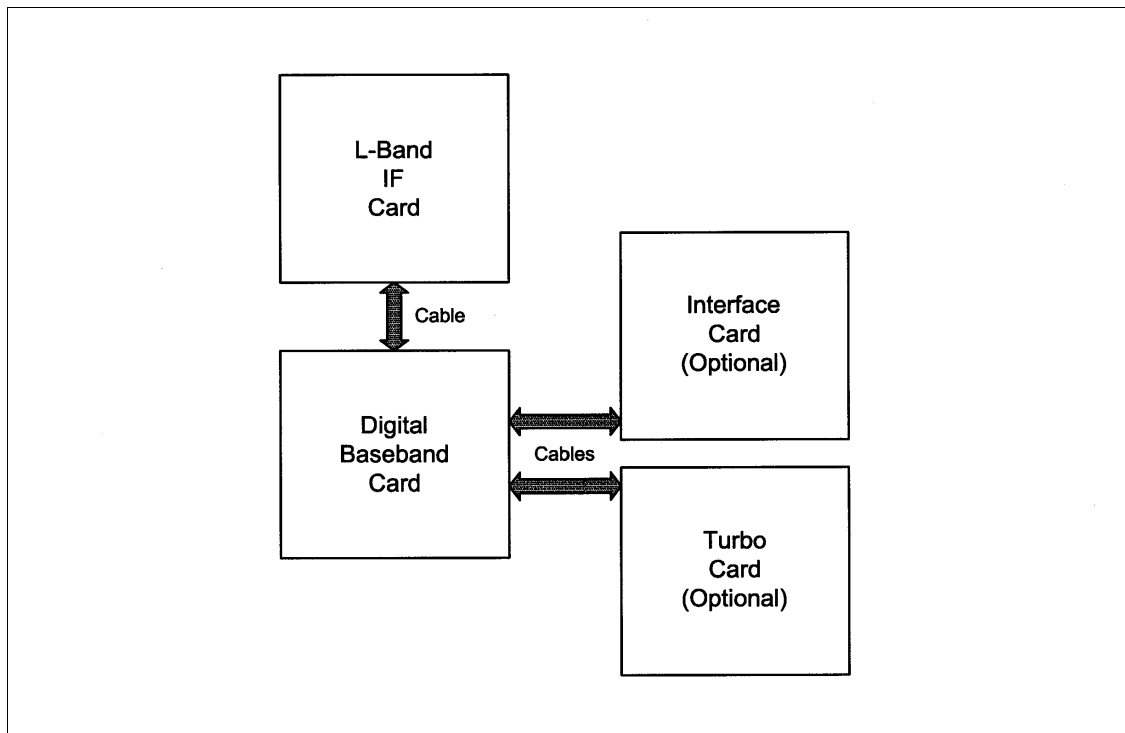


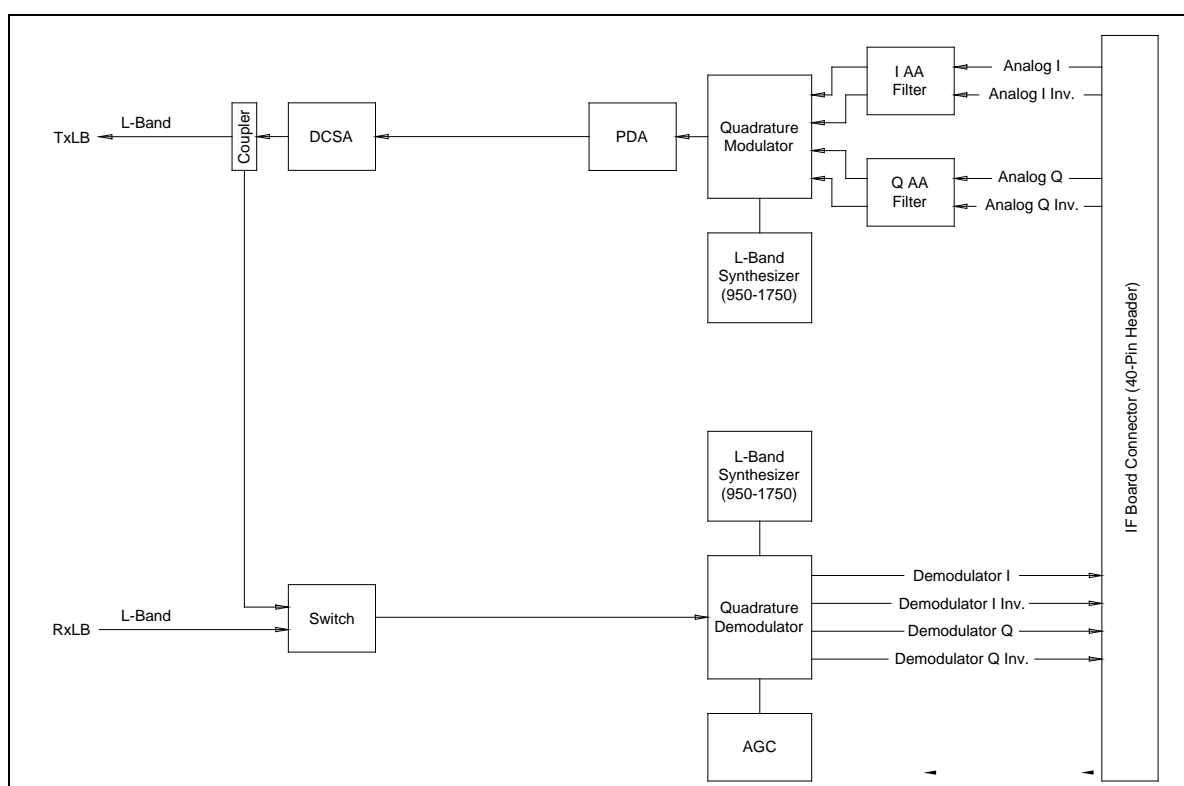
Figure 4-1. OM20 Block Diagram

### 4.1.1 OM20 L-Band Printed Circuit Card

The L-Band Printed Circuit Card consists of an analog modulation function, an analog complex downconversion, and two wide-band digital synthesizers. The block diagram of the L-Band Assembly is shown in Figure 4-2.

In the modulator, analog in-phase (I) and quadrature (Q) signals are generated on the Digital Baseband Printed Circuit Card, routed to the L-Band/IF Printed Circuit Card, and modulated at the desired frequency. The L-Band modulated signal is then passed through a microprocessor controlled variable attenuator providing gain control of the output signal.

In the complex downconverter, the signal for demodulation is amplified and sent through a variable wideband attenuator for AGC. The gain-controlled signal is then passed through a complex downconverter to a low IF.



**Figure 4-2. L-Band Card Block Diagram**



### 4.1.2 OM20 Baseband Processing Printed Circuit Card

The advent of million-plus gate count FPGAs, advanced logic synthesis tools, and DSPs providing hundreds of MIPs enabled the design of a software configurable modem. Large, fast FPGAs now provide designers with what is essentially an on the fly programmable ASIC. High speed, complex digital logic functions that previously could only be implemented in dedicated integrated circuits are now downloaded from a micro-controller through a serial or peripheral interface. When a new digital logic function is needed, a new configuration file is loaded into the FPGA. There is no limit to the number of digital logic configurations available to the FPGA, aside from the amount of Flash memory available to the system microprocessor for storage of configuration files.

The OM20 Baseband Processing Printed Circuit Card provides a flexible architecture that allows many different modes of terrestrial and satellite framing, various FEC options, digital voice processing, and several different modulation/demodulation formats. Also included on the Baseband Printed Circuit Card are three synchronous interfaces on a 25-pin interface supporting RS-422, V.35, and RS-232 data. All three interfaces are provided on the same connector (J3), and are selectable from the terminal or Ethernet ports. Additionally, data may be passed through the Ethernet port (J4). Ensure that the correct interface is selected in the unit prior to connecting to the data interface. Refer to [Section 4](#) for further information on the data interface selection parameters and programming.

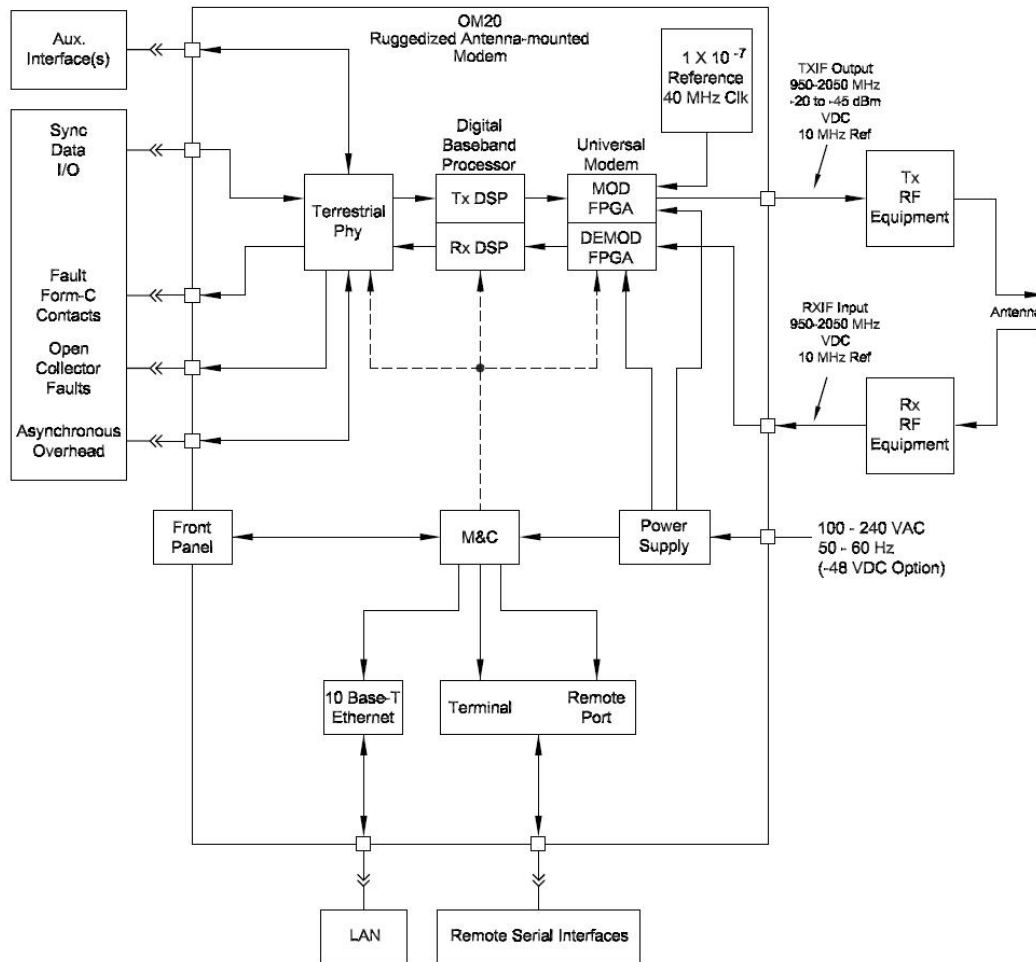
The Baseband Printed Circuit Card also contains the Monitor and Control (M&C) Circuitry responsible for:

- Programmable part setup and initialization
- Continuous control and adjustment of some functions
- Calibration
- Monitoring fault status
- Calculating and displaying measurements
- Calculations
- User monitor and control interface including front panel and remote
- Unit's configuration and feature set

The M&C System is based on a powerful microprocessor with a large amount of Flash memory. Several bus architectures are used to interconnect the M&C to all components of the OM20. Communications to the outside world is done via connections to the remote/terminal/alarm port (J2), or the Ethernet port (J4), and alarm ports. The M&C runs off of software programmed into its Flash memory. The memory can be reprogrammed via the Ethernet port to facilitate changes in software.

## 4.2 OM20 Functional Block Diagram

Figure 4-3 represents the OM20 Functional Blocks. The modem is shown in a typical application with customer data, TX/RX RF equipment, and antenna I/O.



**Figure 4-3. OM20 Outdoor Modem Functional Block Diagram**

### 4.2.1 Baseband Processing

The Baseband Processor performs all of the functions required for an IBS/IDR Framing Unit, a Reed-Solomon Codec, and an E1/T1 Drop and Insert System. In addition, the Baseband Processing Section provides for transmit clock selection and rate adaptation as well as a rate adapter and Plesiochronous/Doppler (PD) Buffer in the receive direction. A multiplexer is also provided for the SCT Clock Source for Loop Timing Applications. The transmit and receive paths may be configured independently under processor control.

### 4.2.2 Tx Baseband Processing

The Tx Data and Clock enters the Baseband Processor, passes through a Rate Adapting FIFO, and enters the Framer/Drop Processor. In Closed-Net Mode, the data passes through the Framer unaltered. In IDR, IBS, and D&I Modes, the framer adds the appropriate framing and ESC as defined in IESS-308 and 309. In D&I Mode, the framer acquires the terrestrial framing structure, E1 or T1, and synchronizes the Drop Processor. The Drop Processor extracts the desired time slots from the terrestrial data stream and feeds these channels back to the framer. The framer then places the ‘dropped’ terrestrial time slots into the desired satellite channel slots. The data is then sent to the Reed-Solomon Encoder.

The Reed-Solomon Encoder encodes the data into Reed-Solomon Blocks. The blocks are then interleaved and synchronized to the frame pattern as defined by the selected specification (IESS-308, IESS-309, DVB, etc.). After Reed-Solomon Encoding, the composite data and clock are applied to the Baseband Loopback Circuit.

### 4.2.3 Rx Baseband Processing

The Receive Processor performs the inverse function of the Tx Processor. Data received from the satellite passes through the Baseband Loopback Circuit to the Reed-Solomon Decoder to the Deframer. The Deframer acquires the IBS/IDR/DVB frame, synchronizes the Reed-Solomon Decoder and extracts the received data and overhead from the frame structure, placing the data into the PD Buffer, sending the overhead data to the UIM. In Closed-Net Mode, the data is extracted from the buffer and is sent to the UIM. Backward Alarm indications are sent to the M&C Subsystem. In Drop and Insert Mode, the Insert Processor synchronizes to the incoming terrestrial T1/E1 Data Stream, extracts satellite channels from the PD Buffer, and then inserts them into the desired terrestrial time slots in the T1/E1 Data Stream.

### **4.3 Monitor & Control (M&C) Subsystem**

The modems M&C system is connected to most of the circuitry on any board contained in the modem. These connections provide status on the working condition of the circuitry as well as providing the data required for the various measurements the modem provides. The M&C processes this information and generates status indications as well as alarms when necessary. Detailed status information is available via the modems various user interfaces including the remote and terminal ports. An external summary fault is available on the RS422 Data interface

The M&C contains a high-performance microprocessor and is responsible for overall command and control of modem functions. The M&C is constantly monitoring all subsystems of the modem by performing a periodic poll routine and configures the modem by responding to commands input to the system. During each poll cycle, the status of each of the subsystems is collected and reported to each of the external ports. Performance statistics such as Eb/No, buffer fill %, etc. are compiled. If faults are detected, the M&C will take appropriate actions to minimize the effect of such faults on the system.

The modem supports the following M&C protocols:

- Terminal Interface (Section 4.2.1)
- Remote Port Interface (RLLP) (Section 4.2.2)
- Ethernet M&C, Web Browser & SNMP (Section 4.2.3)
- Modem Status, Alarms & Contact Closures (Section 4.2.4)

### 4.3.1 Terminal Port

This port supports an asynchronous control protocol as described in Section 4. It is configured to support RS-232 signal levels. This port is intended for use in computer-based remote M&C. All functions of the modem may be monitored and controlled from this port via a common terminal connected to the Terminal Port. This function is front panel selectable.

The Terminal Mode Control allows the use of an external terminal or computer to monitor and control the modem from a full screen interactive presentation operated by the modem itself. No external software is required other than VT-100 Terminal Emulation Software (e.g. “Procomm” for a computer when used as a terminal. The Control Port is normally used as an RS-232 Connection to the terminal device. The RS-232 operating parameters can be set using the modem Front Panel and stored in Non-volatile memory for future use.



#### NOTE

*Refer to the Remote Protocol Manual (TM117) for the Terminal, Remote and SNMP screens and protocols.*

### 4.3.2 Modem Remote Communications (RLLP)

The Remote Port located on J20 allows for control and monitoring of parameters and functions via an RS-232 Serial Interface, or RS-485 for RLLP Protocol. ‘Equipment Remote Mode’ setup can be entered from the front panel or the Web Browser interface under the “System” menu. This requires the user to first set the Remote Port Control to “Remote” then set the Multidrop Address as needed followed by setting the Remote Interface to RS232 or RS485.

Control and status messages are conveyed between the modem and all subsidiary modems and the host computer using packetized message blocks in accordance with a proprietary communications specification. This communication is handled by the Radyne Link Level Protocol (RLLP), which serves as a protocol ‘wrapper’ for the RM&C data. Complete information on monitor and control software is contained in the following sections.

### 4.3.3 Ethernet M&C Port

This port is dedicated for Ethernet Communications supporting SNMP, FTP and Web Browser. The port is configured for 10 Base-T communications protocols. The Ethernet M&C Interface requires a standard RJ45 Male connector. Refer to Appendix E and F for proper setup of the TCP-IP interface and Web Browser Setup.

### 4.3.4 Modem Monitor Status

The modems M&C system is connected to most of the circuitry on any board contained in the chassis. These connections provide status on the working condition of the circuitry as well as providing the data required for the various measurements the modem provides. The M&C processes this information and generates status indications as well as alarms when necessary. Detailed status information is available via the modems various user interfaces (Web browser, remote and terminal). A summary of this information can be connected to external equipment, switches or alarms via the open collector and/or form-C fault connections

#### **Form-C Contacts:**

Two Form-C Relays under processor control are available on the OM20 connector J2

**Mod Fault:** De-energized when any transmit side fault is detected.

**Demod Fault:** De-energized when any receive side fault is detected.

Two Open Collector Faults are available on the OM20 connector J3 pins 10 & 16

**Mod Fault:** Will sink up to 20 ma (maximum) until a transmit or common fault is detected. Will not sink current if a fault is detected.

**Demod Fault:** Will sink up to 20 ma (maximum) until a receive or common fault is detected. Will not sink current if a fault is detected.

The open collector faults are intended for use in redundancy switch applications in order to provide quick status indications.

---

## 4.4 Async Port / ES-ES Communications

This port is dedicated for ES-ES Communications supported by either RS232 or RS485 signal levels. The baud rate and protocol can be selected from the Front Panel. The port may be configured for a number of communications protocols. Overhead data to/from the UIM is routed to/from the framer/deframer. This port is also used by SCC Framing for the in-band data.

---

## 4.5 Internal Clock

The time and date is kept in order to 'time-tag' system events. User can change the Internal Clock via the front panel, Web Browser or Terminal ports.

---

## 4.6 Loopback Features (Terrestrial & IF)

The modem provides for a number of different loopbacks. The Loopback supported are:

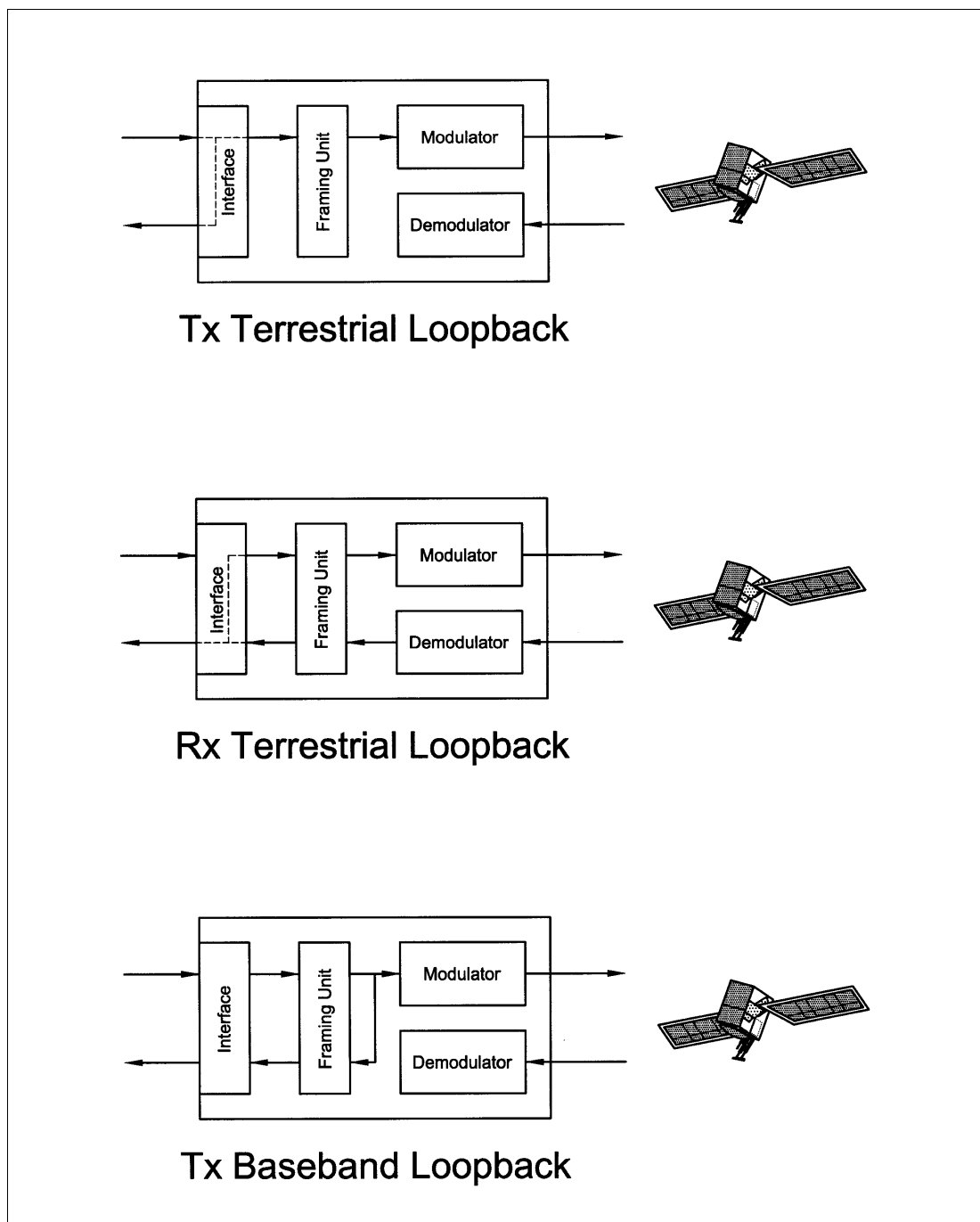
- IF Loopback – Tx IF port is looped back to the Rx IF port
- TX Terrestrial Loopback - Tx Data port is looped back to the Rx Data port after the interface driver/receiver. (prior to the framing unit)

- TX Baseband Loopback - Tx Data port is looped back to the Rx Data port after the interface driver/receiver. (after the framing unit)
- RX Terrestrial Loopback - Receive Data from the satellite is looped back for retransmission to the satellite, providing a far end loopback. (prior to the framing unit)
- RX Baseband Loopback - Receive Data from the satellite is looped back for retransmission to the satellite, providing a far end loopback. (after to framing unit)
- TX/RX Terrestrial Loopback - provides both Terrestrial loopbacks simultaneously
- TX/RX Baseband Loopback - provides both Baseband loopbacks simultaneously



## NOTE

*Usage of the modems loopback capabilities in conjunction with the Ethernet data interface can produce undesirable network loops. In order to run any type of data test with an Ethernet interface you must utilize two modems connected back to back. Simply using one modem and a loopback will not produce the desired results.*



**Figure 4-4. Loopback Functional Block Diagram**



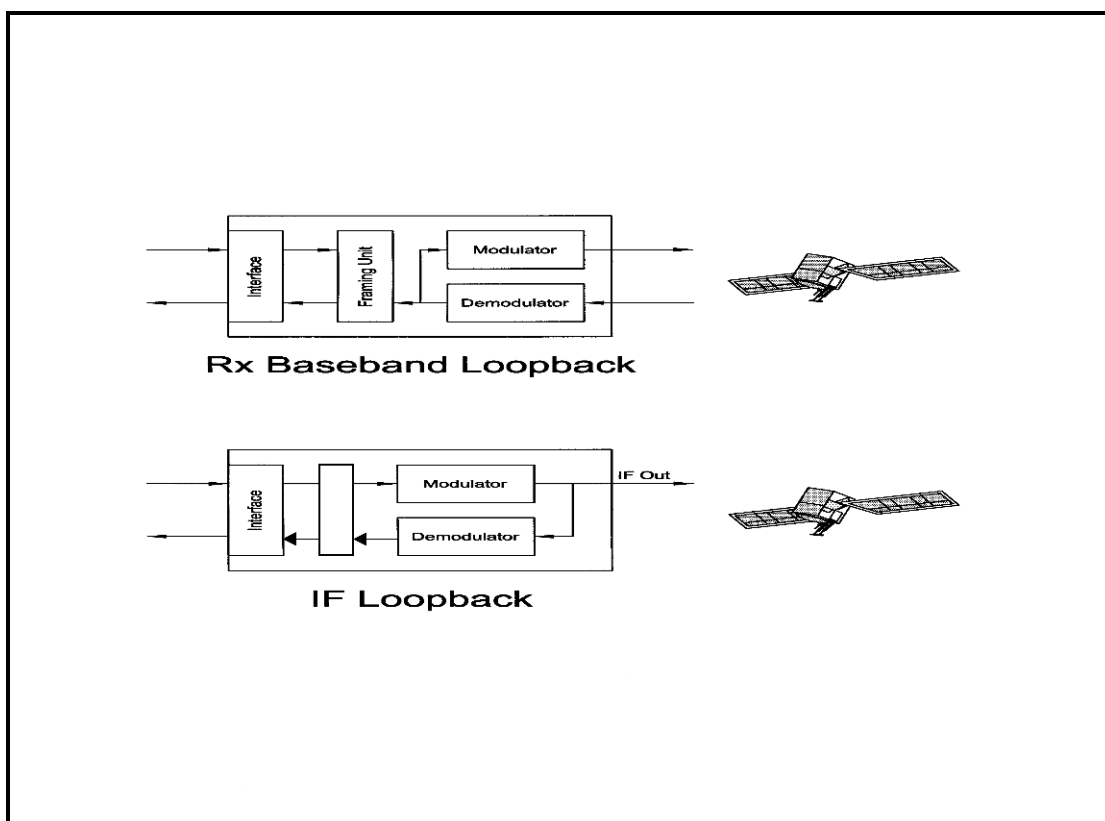


Figure 4-5. Loopback Functional Block Diagram

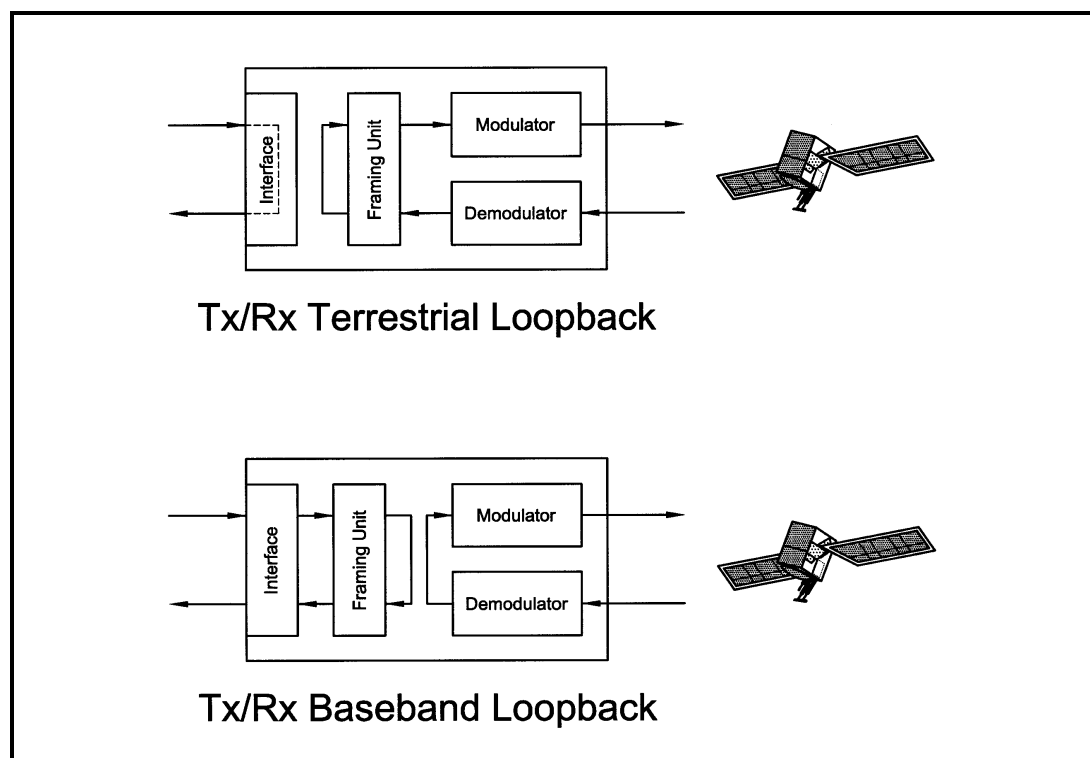


Figure 4-6. Loopback Functional Block Diagram

## 4.7 Clocking Options

The modem supports a number of different clocking options that can be recovered from the satellite or the terrestrial links. The various clocking options allow users to determine which clock will best fit their applications. Figure 4-7 gives an overview on how the modem processes the various clocks for the Tx Clock source and the Rx Buffer Clock source. Tx and Rx Clocks may be independently locked.

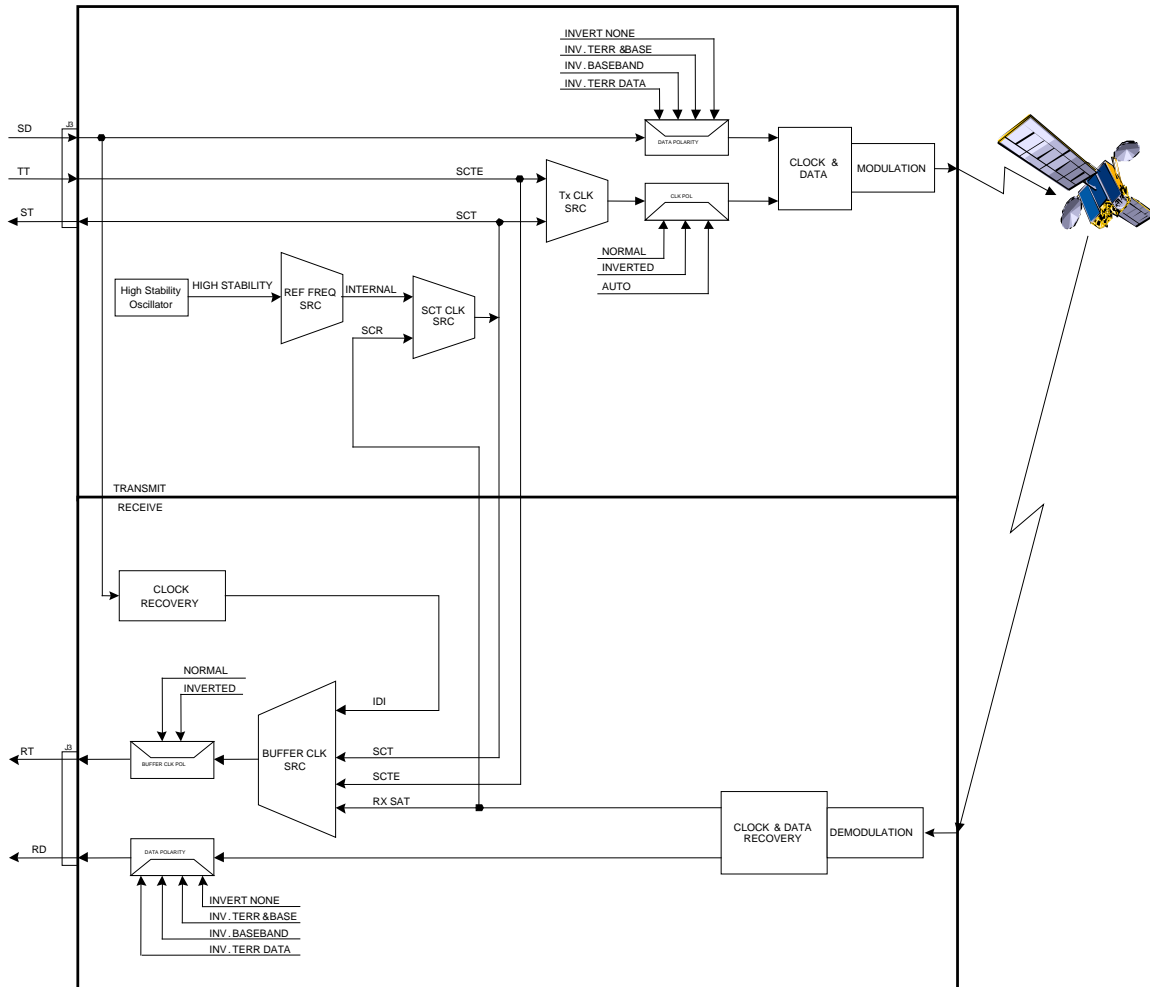


Figure 4-7. Clocking and Polarity Diagram

### 4.7.1 TX Clock Options

TX clock options can be recovered from the terrestrial interface, satellite interface or internally generated. The allows users to select SCTE Clock (Terrestrial) or the SCT internal clock. The modem also allows user to recover the SCT Clock from the satellite (SCR) or from the modem internally. The modem allows users to select clock polarity. The Tx clock selections available are:

The following paragraphs define the types of clocking options available to the user at the Front Panel.

- SCT (Internal Oscillator)
- SCTE (External Tx Terrestrial Clock)
- Rx Satellite Clock

#### 4.7.1.1 SCTE: Serial Clock Transmit External

The SCTE clock is the Transmit Terrestrial Clock associated with the data interface. SCTE is an external clock received from the terrestrial equipment and the modem utilizes the terrestrial clock to lock the internal clock.

In Figure 3-7, the Transmit Terrestrial Data enters the modem and is clocked into a dejitter FIFO. Data is clocked out of the FIFO by the Modulator Clock. The Modulator Clock and Phase-Locked Loop (PLL), in conjunction with the Dejitter FIFO, which reduces the input jitter. Jitter reduction exceeds the jitter transfer specified in CCITT G.821.

SCTE is sometimes referred to as Tx Terrestrial Timing or Terminal Timing. Terminal Timing is reference to the RS422 synchronous interfaces.

#### 4.7.1.2 SCT: Serial Clock Transmit

The SCT clock can be generated internally or recovered from the satellite. The SCT clock source can be used as the TX clock source, RX Buffer Clock source and the Terrestrial Terminal equipment for clocking the transmit data. If the SCT clock is recovered from the satellite, then it is referred to as SCR. SCR is also referred to as Receive Clock, Satellite Clock, or Receive Timing (RT).

When SCT clock is configured as Internal, the frequency of the clock is set the same as the Transmit Terrestrial Clock rate. If SCT clock is configured as SCR, the internal clock is set to the same rate as the incoming receive satellite clock. SCT is sometimes referred to as Internal Timing or Send Timing (ST). In the event that the satellite clock is lost, the modem will automatically switch over to the Internal Clock and revert back to SCR when activity is detected.

If SCT is selected, then Terrestrial data that is synchronous to the SCT Clock is required to be supplied by the modem. It is intended for the terminal equipment to use the SCT as its clock source. The Autophase Circuit will automatically ensure that the data is clocked correctly into the modem. Therefore, a return clock is not necessary. The Clock Polarity should be set to Auto.

### 4.7.2 RX Buffer Clock Options

The modem supports a number of RX Buffer clock options that can be recovered from the satellite, terrestrial links, internally or externally. The various clocking options allow users to determine which clock will best fit their applications. Figure 3-7 gives an overview on how the modem processes the various clocks for the Tx Clock and the Rx Buffer Clock. The modem allows users to select clock polarity Tx and Rx Clocks may be independently locked. The following RX Buffer clock selections are available:

- Rx Satellite Clock (Recovered from Satellite)
- SCTE (External Tx Terrestrial Clock)

- SCT (Internal Oscillator)
- EXC Clock/EXT BNC (External Clock Source)
- EXT IDI (Drop and Insert)

The modem handles RX Buffer clock selections based on source priority levels. The user assigns priorities to the clock sources based on source selections. Source 1 has the highest priority and Source 5 being the last resort or lowest priority. If a fallback clock is selected and activity is lost at the highest priority source, the modem will fall back to the next highest priority clock with activity. When activity resumes on a higher priority source, the modem resumes using the higher priority source

<u>Clock Source</u>		<u>Priority</u>		
RX SAT	1	of	5	
SCTE	2	of	5	
SCT	3	of	5	
EXC BNC	4	of	5	Not Supported in the OM20
EXT IDI	5	of	5	

Refer to the Remote Protocol Manual TM117 for Web Browser manual TM117.

#### 4.7.2.1 RX SAT Clock

The RX Sat clock is recovered from the satellite that is received from the distant end. If selected the Buffer Clock is lock to the RX sat clock.

#### 4.7.2.2 SCTE: Serial Clock Transmit External

When SCTE is selected as the Rx Buffer clock, the modem receives the clock from the Transmit Terrestrial interface.

#### 4.7.2.3 SCT: Serial Clock Transmit

If SCT clock is selected as the RX Buffer clock source, then it should be configured for internal. SCT is sometimes referred to as Internal Timing or Send Timing (ST).

#### 4.7.2.4 EXT CLK/EXT BNC:

The External Clock connector is not supported in the OM20.

#### 4.7.2.5 EXT IDI: Insert Data In

External IDI is used only for E1/T1 Drop and Insert applications. The available T1/E1 Frame Source selections are External, Internal, and IDI/DDO Loopback. The T1/E1 Frame Source selections can be accessed in the INTERFACE/RX SETUP menus. If Ext IDI is selected as the RX Buffer clock, then user must first specify T1/E1 Frame Source.

- External (RX Buffer Clock recovered from the data)
- Internal (RX Buffer Clock recovered from the internal clock)
- IDI/DDO Loopback (RX Buffer Clock recovered from the data and looped back)

### 4.7.3 EXT REF: External Reference, Optional

The External Clock connector is optional and must be requested at time of order. This is not actually a clock, but does have some clocking implications. When the external reference is used, the master oscillator within the modem is locked to the external reference, and the internal accuracy and stability of the unit assumes that of the External Reference. Therefore, not only are the transmit frequencies locked to the external reference, but the modem's internal SCT Oscillator is locked to the external reference as well.



#### NOTE

*External reference port input is specified at  
.1Vpp to 5Vpp (Sine or Square wave)*

## 4.8 RS422/V.35 Interface J3 (Standard option)

Data must be clocked into the modem by either the SCTE or SCT Source. If SCTE is selected as the Tx Clock Source, then SCTE must be supplied to the modem on the EIA-530 port. The output of the dejitter buffer will be clocked with this source. SCT should be used if SCTE has excessive jitter.

### 4.8.1 G.703 Interface (Optional)

G7103 is an optional interface option. The G703 option supports both balanced and unbalanced interface types. The modem support If the G.703 Interface is selected, then the Tx Clock Source will default to SCTE and the Clock Polarity will default to Auto.

Loop timing with a G.703 Interface or Asymmetrical Data Rates requires external equipment at the remote end that is capable of using the recovered RD Clock as source timing for (SCTE) SD. The modem will not manipulate the clock frequency. Therefore, the transmit and receive clock rates must be equal in order for the modem to perform loop timing.

### 4.8.2 Ethernet Data Interface J4 (Optional)

The modem support a 4 port 10/100 Base-T or a 10/100/1000 Base T Interface. When this interface is selected additional menus will be displayed. Refer to Appendix J for interface set up and description of supporting features.

When Ethernet Data Interface is selected, the Tx Clock Source will default to SCTE and the Clock Polarity will default to Normal. In addition, the Buffer Clock will default to RxSat and the Buffer Clock Polarity will default to Normal.

## 4.9 Reed-Solomon Codec

Utilizing a Reed-Solomon (R-S) Outer Codec concatenated with a Convolutional Inner Codec is an effective way to produce very low error rates even for poor signal-to-noise ratios while requiring only a small increase in transmission bandwidth. Typically, concatenating an R-S Codec requires an increase in transmission bandwidth of only 9 – 12% while producing a greater than 2 dB improvement in  $E_b/N_o$ . R-S is a block Codec where K data bytes are fed into the encoder which adds  $2t = (N - K)$  check bytes to produce an N byte R-S block. The R-S decoder can then correct up to “t” erred bytes in the block. Refer to Figures 4-8, 4-9 and Table 4-1

### 4.9.1 Reed-Solomon Operation in the OM20

When the Reed-Solomon Codec is enabled, data is fed to the R-S Encoding Section of the OM20 where it is scrambled, formed into blocks, R-S encoded, and interleaved. Unique words are added so that the blocks can be reformed in the Receiving Modem. Data is then sent to the modulator where it is convolutionally encoded, modulated, and transmitted to the satellite.

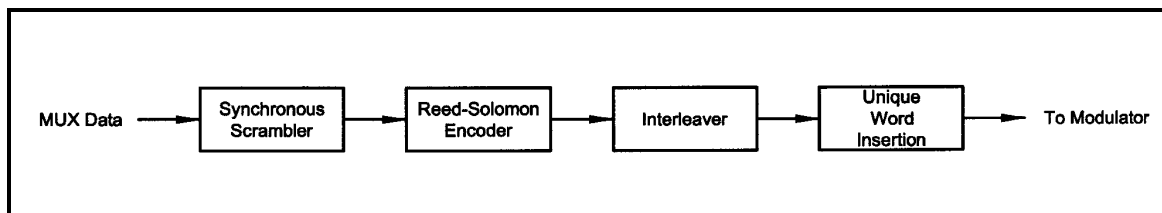
When the signal is received and demodulated by the Receiving Modem, it is fed to a Viterbi Decoder for the first layer of error correction. After error correction is performed by the Viterbi Decoder, the unique words are located and the data is de-interleaved and reformed into blocks. The R-S Decoder then corrects the leftover errors in each block. The data is then descrambled and output from the R-S Section.

### 4.9.2 Reed-Solomon Code Rate

The R-S Code Rate is defined by (N, K) where N is the total R-S block size in bytes - data + check bytes - and K is the number of data bytes input into the R-S Encoder. The transmission rate expansion required by the R-S Codec is then defined by N/K. The OM20 automatically sets the correct R-S code rate for IDR/IBS open network operation in accordance with the data shown in Table 4-1. In Closed Net Mode, the OM20 allows the following N and K setting: (126, 112), (219, 201), (194, 178), (225, 205).

### 4.9.3 Interleaving

The OM20 allows for interleaving depths of 4, 8 or 12 R-S Blocks. This allows burst errors to be spread over multiple blocks in order to enhance the error correcting performance of the R-S Codec. For Intelsat Network Modes, the modem automatically sets the interleaving depth to 4 for QPSK or BPSK, or 8 for 8PSK. In Closed Network Mode, the interleaver depth can be manually set to 4 or 8, and in DVB Network Mode, the unit automatically sets the interleaver depth to 12.



**Figure 4-8. Reed-Solomon Encoder Functional Block Diagram**

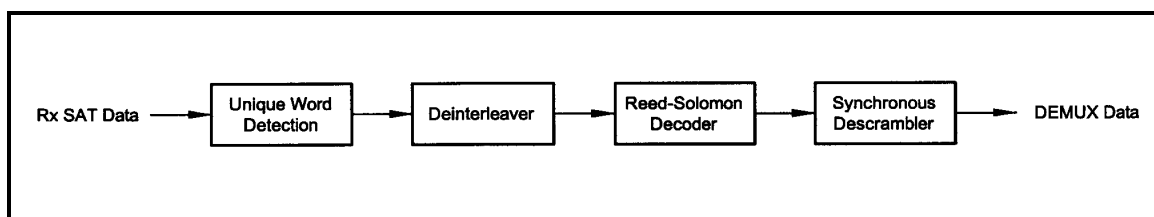


Figure 4-9 Reed-Solomon Decoder Functional Block Diagram

Table 4-1. Reed-Solomon Codes					
Type of Service	Data Rate (Kbps)	R-S Code (n, k, t) <sup>1</sup>	Bandwidth Expansion [ (n/k) - 1 ]	Interleaving Depth	Maximum <sup>2</sup> R-S Codec Delay (ms)
<b>Small IDR (With 16/15 O/H)</b>	64	(126, 112, 7)	0.125	4	115
	128	(126, 112, 7)	0.125	4	58
	256	(126, 112, 7)	0.125	4	29
	384	(126, 112, 7)	0.125	4	19
	512	(126, 112, 7)	0.125	4	15
	768	(126, 112, 7)	0.125	4	10
	1024	(126, 112, 7)	0.125	4	8
	1536	(126, 112, 7)	0.125	4	5
<b>IDR (With 96 Kbps O/H)</b>	1544	(225, 205, 10)	0.0976	4	9
	2048	(219, 201, 9)	0.0896	4	7
	6312	(194, 178, 8)	0.0899	4	2
	8448	(194, 178, 8)	0.0899	4	<2
<b>8PSK</b>	1544	(219, 201, 9)	0.0896	8	18
	2048	(219, 201, 9)	0.0896	8	13
	6312	(219, 201, 9)	0.0896	8	4
	8448	(219, 201, 9)	0.0896	8	3
<b>DVB</b>	All	(204, 188, 8)	0.0851	12	-
1. <i>n</i> = code length, <i>k</i> = information symbols and <i>t</i> = symbol error correcting capability. 2. Design objective.					

## 4.10 Drop and Insert (D&I)

Refer to Appendix E

## 4.11 OM20 Automatic Uplink Power Control (AUPC Operation)

Refer to Appendix F

## 4.12 Asynchronous Overhead Operation J3 (Framing/Multiplexer Capability)

The Asynchronous Framing/Multiplexer is capable of multiplexing a relatively low-speed overhead channel onto the terrestrial data stream resulting in a slightly higher combined or aggregate data rate through the modem. The overhead channel is recovered at the far end. This added channel is termed variously “An Overhead Channel”, “Service Channel”, “Async Channel” or in IESS terminology an “ES to ES Data Channel.” The basic frame structure used by the multiplexer is that specified in the IESS-309 Standard, resulting in a 16/15 Aggregate ratio of overhead & data to data rates.

For Regular Async: (Standard IBS), the Baud Rate is approximately 1/2000 of the Data Rate listed in Table 4-2.

For Enhanced Async: (IBS Async.), the Baud Rate is selectable, but Data Rate is limited.

The maximum Baud Rate is 19,200 bps for IBS Async. Two software-controlled modes are designed into the card to best utilize the available bits; “Standard IBS” and “IBS (Async)”. The characteristics of the Channel Interface are also determined by the standard or Async mode.

The Async Channel can be set under software-control to either RS-232 or RS-485 mode. The pin assignments for both modes are shown in Table 4-2.

The “RS-485” Setting controls the output into tri-state when the modem is not transmitting data, allowing multiple modem outputs to be connected together.

Table 4-2.			
Kbps	Baud Rate Example for Standard IBS	Kbps	Baud Rate Example for Enhanced Mode
128	64	9.6	300
256	128	19.2	600
384	192	32	600
512	256	64	1200
640	320	128	2400
768	384	192	4800
896	448	256	4800
1024	512	320	9600
1152	576	384	9600
1280	640	448	9600
1408	704	512	9600



1536	768	576	9600
1664	832	640	19200
1792	896	704	19200
1920	960	768	19200
1920	960	768	19200
2048	1024	832	19200
		896	19200
		960	19200
		1024	19200
		1088	19200
		1152	19200
		1216	19200
		1280	19200
		1344	19200
		1408	19200
		1472	19200
		1536	19200
		1600	19200
		1664	19200
		1728	19200
		1792	19200
		1856	19200
		1920	19200
		1984	19200
		2048	19200

### 4.13 Standard IBS Mode

In the first or “Normal” mode, all bit assignments are per the IBS standard. The bits of Overhead Housekeeping byte 32 are implemented as shown in Table 4-3 below:

Table 4-3.		
<b>Bit 1</b>	ES to ES Data Channel	This bit is routed directly to the ES to ES Data Channel. Its data rate is 1/512 <sup>th</sup> of the aggregate rate (or 1/480 <sup>th</sup> of the through terrestrial data rate), and is normally used to super-sample an asynchronous data channel.

<b>Bit 2</b>	Frame Alignment	Part of the Frame Alignment word.
<b>Bit 3</b>	Backward Alarm	Transmit and Receive with main processor to activate Main Alarm/LED.
<b>Bit 4</b>	Multiframe Message	As per IBS.
<b>Bits 5 and 6</b>	Spare	Not currently utilized.
<b>Bits 7 and 8</b>	Encryption Utilization	Not currently utilized.

The ratio of the Through Terrestrial Data Channel Rate to the aggregate rate is 15/16. The standard transmit and receive channels of the ES to ES Data Channel in Standard IBS Mode are raw channels operating at the specific bit rate as controlled by the data channel rate, without buffering. In addition, no clocks are provided with this channel. Since it would be rare that the data rate provided was exactly that required for a standard rate device, the only method of communicating using this channel is to allow it to super-sample the user data.

---

#### 4.14 Asynchronous Multiplexer Mode

Since many of the frame bits in the standard IBS mode are not used, an “Enhanced” Multiplexer Mode has been implemented that can be engaged under software control. Since this mode changes the use of many of the framed non-data bits, this mode is only usable when the modem is at both ends of a link.

In this mode, the overhead signaling bytes 16 and 48 can be used to implement a significantly higher speed ES to ES Data Channel under software control. When implemented, this rate is 16 times that of the normal IBS standard, or  $1/30^{\text{th}}$  of the terrestrial data rate ( $1/32^{\text{nd}}$  of the aggregate rate).



*The IBS Async mode **MUST** be selected for true Asynchronous channel operation to be available.*

---

## 4.15 ESC Backward Alarms

When running in IDR Mode and if the modem has the ESC Option, there will be four Backward Alarms available for use by the earth stations at each end of the link (both ends must have the ESC option). These alarms are accessed via the ESC ALARMS Port. The four alarms are controlled by four relays, each having a normally open, normally closed, and a common connection. The common connections of these relays (referred to as Backward Alarm Inputs) can be connected to whichever system on the earth station that the user wishes to trigger the backward alarm.

When ground is applied to the Common (Input) Connection of one of these relays, that relay and associated backward alarm will then be in a “no fault” state. When the ground is removed, the relay and the associated Tx Backward Alarm will toggle to the faulted state. When in the faulted state, the receive end of the link will receive that backward alarm that is initiated at the transmit end of the link.

The user can connect whichever systems on the earth stations that they desire to these Backward Alarms Relays as long as they will supply ground to the Backward Alarm Relay Input in the “no fault” condition and the ground will be removed in the “faulted” condition.

For example: the user could connect the Demod Summary Fault of the modem to the Backward Alarm 1 Input, so that if the demod went into Major Alarm (such as a Carrier Loss), Backward Alarm 1 would be transmitted to the receive end of the link. At the receive end, it would show up as Rx Backward 1 (Receive Backward Alarm 1).

### 4.15.1 To Disable the ESC Backward Alarms

If the ESC ALARMS Port will not be used and the Backward Alarm Indications are to be disabled, you must connect pins 10, 11, 22 and 23 to pin 1 (gnd) on ESC Alarms port.

## 4.16 Satellite Control Channel (SCC)

The SCC format uses a variable overhead rate to transmit an asynchronous data channel in addition to the normal data channel. The SCC asynchronous mode implemented on the DMD20 is "PassThru" Mode.

In Pass Thru Mode, there is no formatting or deformatting of the input data in the buffer, and it is transmitted on a first-in first-out basis. In band data entering the remote port is inserted into the user data stream. The in-band data is received and passed on to the user without any deformatting or depacketizing involved. The maximum in band rate supported is 115200bps.

The Asynchronous Data Interface (J17) is a 9-Pin Female "D" Connector. The data interface is either RS232 or RS485 via a front panel selection. Refer to Table 5-7 for pinouts.

### 4.16.1 SCC Framing Structure

Each SCC frame consists of the following:

- A 10-bit synchronization pattern called the Synchronizing Word.
- Multiple variable length slots filled with user data.
- Multiple 10-bit control words that contains eight bits of in-band data (the extra two bits are for the async start/stop).

The number of user data slots and control words per frame is selected by the SCC Control Ratio Parameter. This can be any value from 1 to 1 through 1 to 7. A higher ratio allows a lower overhead rate but since there are less Sync Words, there is a higher acquisition time.

The following examples show a control ratio of 1 to 3 and 1 to 1. Example 1 shows three Control Words for every Synchronizing Word, and Example 2 shows one Control Word for every Synchronizing Word.

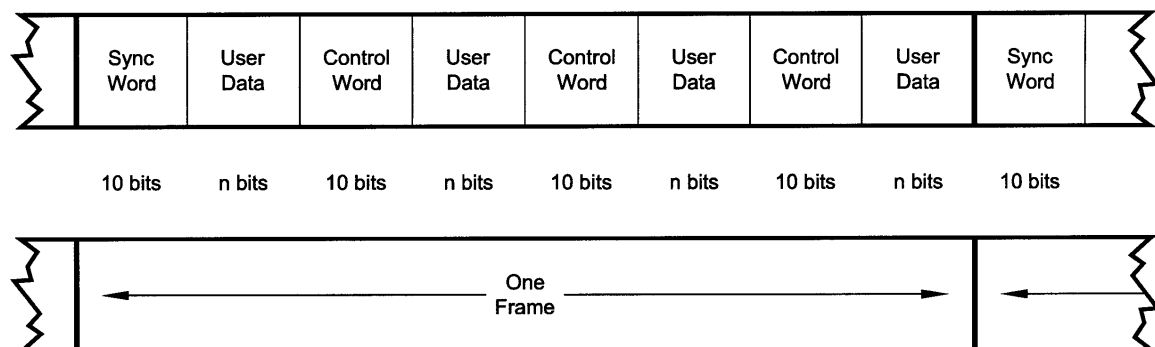
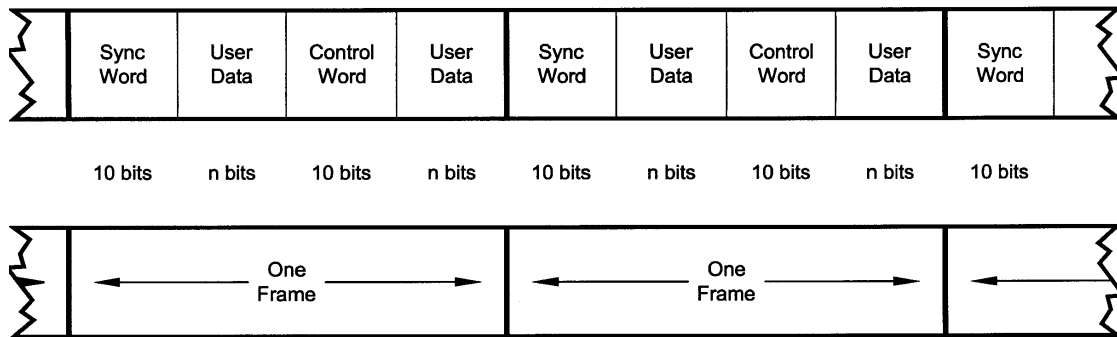


Figure 4-10. 1 to 3 Control Ratio diagram



**Figure 4-10. 1 to 1 Control Ratio diagram**

The Control Ratio of the receiving units must match the Control Ratio of the transmitting unit.

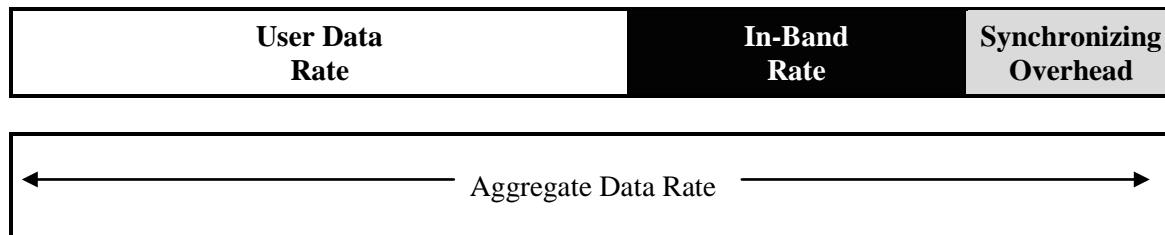
#### 4.16.2 Aggregate Data Rate

The aggregate data rate equals the following:

$$\text{User Data Rate} + \text{In-Band Rate} + \text{Synchronizing Overhead Rate}$$

Because SCC must adjust the overhead so that there are an equal number of user data bits in each slot, the synchronizing overhead cannot be easily calculated. However, dividing the In-Band Rate by the Control Ratio can approximate it. The following equation shows the basic calculation of this rate:

$$\text{Aggregate Data Rate} = \text{User Data Rate} + \text{In-Band Rate} + (\text{In-Band Rate}/\text{Control Ratio})$$



As an example, given the following parameters:

User Data Rate: 1,024,000 bps  
 In-Band Rate: 19,200 bps  
 Control Ratio: 1 to 7

*Aggregate data rate = 1,024,000 + 19,200 + (19,200/7) or approximately 1,045,942 (actually 1045974).*

This gives an overhead ratio of  $1,045,974/1,024,000 = 1.021$

*In addition, another constraint changes the actual Aggregate Data Rate. The user data slot size is limited to 2,500 bits. Because of this, the modem increases the in-band rate to reduce the user data slot size. This only happens at higher user data rates.*

*NOTE: The Maximum In-Band rate is 115200. The Async interface Rate must be equal or greater in value.*

### 4.16.3 Overhead Rate Comparison

The SCC Overhead Ratio varies depending on the User Data Rate, the In-Band Rate, and the Control Ratio. This gives SCC the advantage of lower overhead rates when compared to IBS, which has a fixed overhead ratio of 16/15 or 1.067. The following table gives some examples of SCC overhead rates for different user data and control ratios.

User Data Rate	In-Band Rate	Control Ratio	Aggregate Data Rate	Overhead Ratio
512,000	19,200	1/7	533,974	1.043
1,024,000	19,200	1/7	1,045,974	1.021
2,048,000	19,200	1/7	2,069,951	1.011
3,072,000	19,200	1/7	3,093,943	1.007
4,096,000	19,200	1/7	4,117,951	1.005
6,312,000	19,200	1/7	6,337,248	1.004
6,312,000	19,200	1/3	6,337,606	1.004
6,312,000	19,200	1/1	6,350,418	1.006

### 4.16.4 Actual Overhead Rate Calculation

The following is the actual calculation the modem does to calculate the overhead ratio:

1. The modem calculates the minimum in-band rate to limit the size of the user data slots to 2,500 bits (the result is truncated to an integer).

$$\text{Minimum In-Band} = (\text{User Data Rate} * \text{Control Ratio}) / ((\text{Control Ratio} + 1) * 250)$$

2. Using the bigger of Minimum In-Band or the selected In-Band, the modem calculates the number of bits for each user data slot (result is truncated to an integer).

$$\text{Slot Bits} = (\text{User Data Rate} * (\text{Control Ratio} * 10)) / (\text{In-band Rate} * (\text{Control Ratio} + 1))$$

*Note: Slot bits of 0 are invalid.*

The actual ratio the modem uses is:

$$\text{Actual Ratio} = (\text{Slot Bits} + 10) / \text{Slot Bits}$$

**Example 1:**

User Data Rate: 1,024,000 bps

In-Band Rate: 19,200 bps

Control Ratio: 1 to 7

Minimum In-Band =  $(1,024,000 * 7) / ((7 + 1) * 250) = 3,584$  (*less than In-Band Rate*)

Slot Bits =  $(1,024,000 * (7 * 10)) / (19,200 * (7 + 1)) = 466$ Actual Ratio =  $(466 + 10) / 466 = 1.021$ **Example 2:**

User Data Rate: 6,312,000 bps

In-Band Rate: 19,200 bps

Control Ratio: 1 to 7

**4.16.5 SCC Overhead Channel Setup**

1. Set the Framing Mode (located under Mod and Demod Data Menus) to SCC. After doing this, two new menus will appear to the right of the Framing Menu, for both the Mod and Demod. The new menus will be:
  - i. **SCC CTL RATIO**
  - ii. **SCC INBAND RATE**
2. Set the desired SCC control ratio:
  - i. SCC CTL RATIO {1/1, 1/2, 1/3, 1/4, 1/5, 1/6, 1/7}
  - ii. This allows the user to simulate the framing used by the Satellite Control Channel Option (Pass-Thru Mode only). The SCC CTL RATIO is the ratio of overhead in-band data to synchronizing words.
3. Set the desired SCC in-band rate:
  - i. SCC INBAND RATE {300 to 115200}
  - ii. This allows the user to request the rate of in-band data for the overhead channel. This sets the overhead amount only. The actual amount of data that can be passed through the overhead channel will be set under "ES Baud Rate" (see Step 6 below).
4. Under the Interface > General menus, locate the TX ASYNC MODE (menu).
5. Under the TX ASYNC MODE Menu, set the desired ES Interface type:
  - i. ES INTERFACE {RS-232, RS-485}
  - ii. This allows the user to select the interface type.
6. Under TX ASYNC MODE Menu, set the desired baud rate for the ASYNC Port (J17). This will be the baud rate that will pass through the overhead channel:

- i. ES BAUD RATE {150 - 115200}
  - ii. This allows the user to select the baud rate of the ASYNC port (J17) in SCC Mode.
7. Under TX ASYNC MODE Menu, set the desired ES BITS/CHAR:
  - i. ES BITS/CHAR {7,8}
  - ii. This allows the user to choose between 7 or 8 bits of data.
8. Repeat Steps 4 through 7 under the RX ASYNC MODE (menu)
9. The physical connection to the overhead channel will be the DB-9 Female Port labeled ASYNC (J17).

<b>SCC Overhead Chart Examples</b> <b>(Viterbi 3/4 w/V.35 Scrambler)</b>			
<b>Modem Data Rate Kbps</b>	<b>SCC Control Channel Rate</b>	<b>In-Band Overhead Rate Setting</b>	<b>Symbol Rate</b>
9.6	1/1	300	6800
9.6	1/2	300	6700
9.6	1/3	300	6667
9.6	1/4	300	6650
9.6	1/5	300	6641
9.6	1/6	300	6634
9.6	1/7	300	6629
9.6	1/1	9600	19200
9.6	1/2	9600	17067
9.6	1/3	9600	15543
9.6	1/4	9600	14400
9.6	1/5	9600	14400
9.6	1/6	9600	14400
9.6	1/7	9600	14400
512	1/1	9600	354165
512	1/2	9600	350948
512	1/3	9600	349867
512	1/4	9600	349346
512	1/5	9600	349201
512	1/6	9600	348802
512	1/7	9600	348658



## 4.17 EDMAC Satellite Framing/Deframing Mode

The modem supports EDMAC satellite framing. EDMAC can be enabled for both modulator and demodulator satellite framing when modem is configured in CLOSED NET applications. EDMAC satellite framing DOES NOT allow control or monitoring of the remote slave modem. On the demodulator, terrestrial data is framed with NULL EDMAC commands, having no effect at the remote demodulator. On the demodulator, EDMAC commands are stripped from the satellite data stream and discarded, leaving the terrestrial data stream intact. EDMAC Framing/Deframing is provided for compatibility purposes only.

---

## 4.18 Locating the ID Code Operational Procedure

The modem has unique ID codes that allow the user to add feature upgrades to the modem without the unit having to be returned to the factory. Users are required to identify these ID codes when they want additional features added to their unit. Radyne will supply a new ID code that is required to be entered in the ID code field. Once the new ID code is entered, the modem will activate the new features.

Refer to Appendix B for upgrade procedures.

---

## 4.19 Strap Codes

The Strap Code is a quick set key that sets many of the modem parameters. For quick setup of the modem, Strap Codes are very helpful. When a Strap Code is entered, the modem is automatically configured for the code's corresponding data rate, overhead, code rate, framing, scrambler type and modulation. An example of how to set a strap code follows:

**Example:** In the Ethernet interface <Modulator> Menu, depress the Transmit Gel-tab, then move the cursor down and depress "General". Now move the cursor over to 'Strap Code'. Click inside the box and enter the new strap code submenu and enter #16. The modem will be automatically configured to the parameters shown below in the highlighted row 'Strap Code 16'.

Refer to [Appendix G](#) for the various strap code options.

**Notes:**

[illegible]

# Chapter 5. Rear Panel Interfaces

This section discusses the electrical interfaces available of the unit.

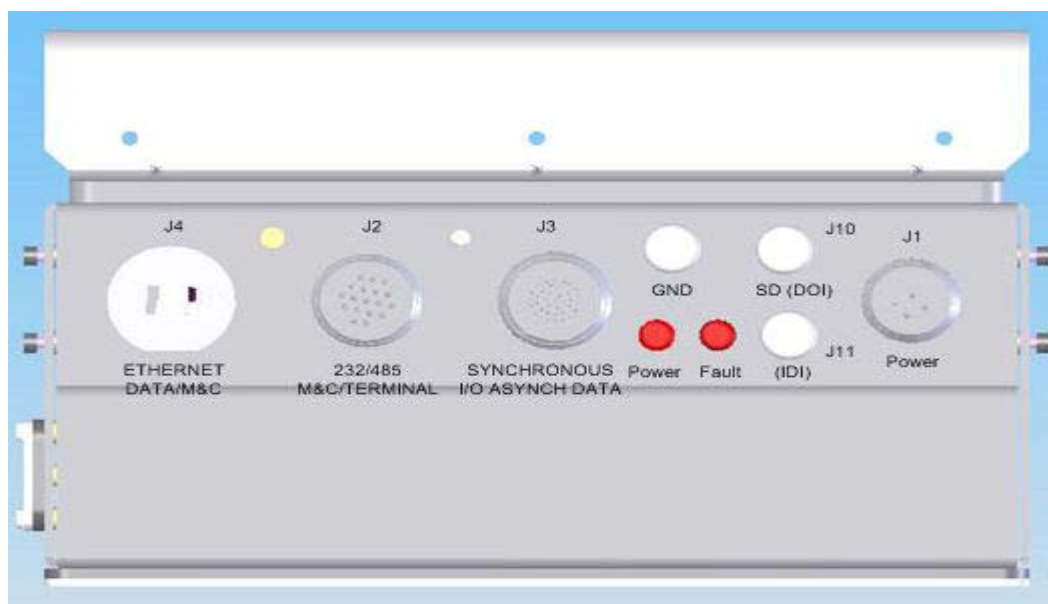
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## 5.1 OM20 External Interface Connections

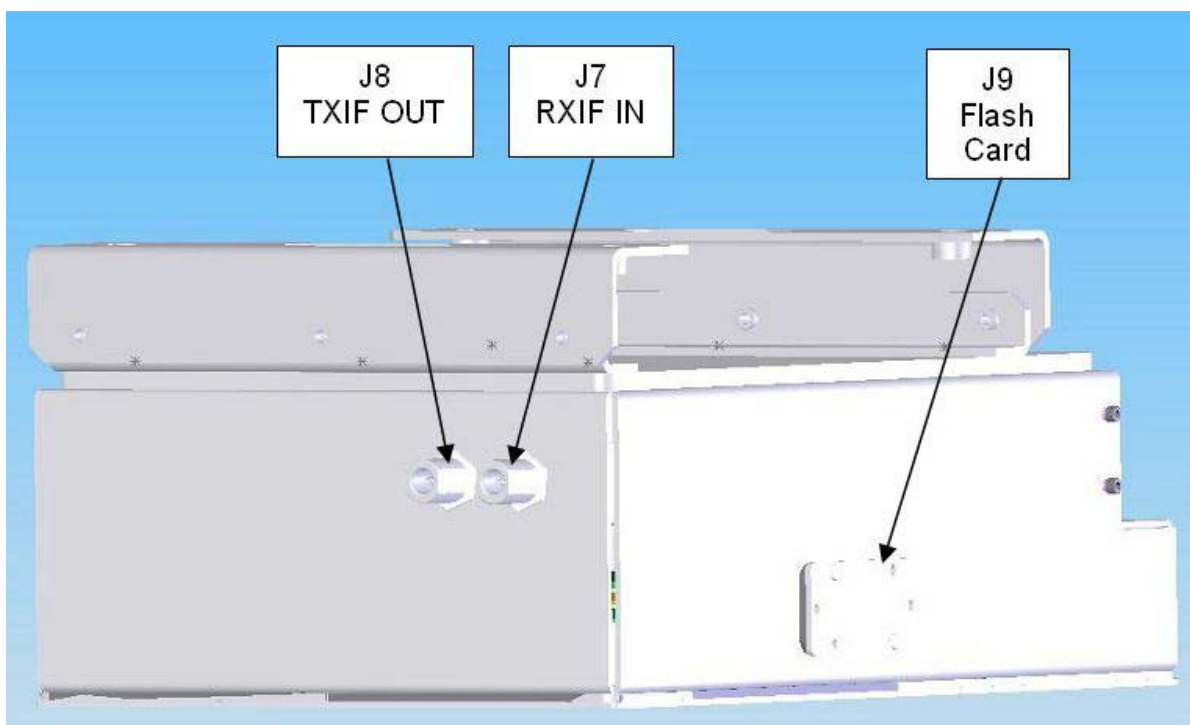
All OM20 external connections are interconnected to labeled connectors located on the front of the unit. Any connection interfacing to the OM20 must utilize the appropriate mating connector (supplied). Refer to Table 5.1 and Figure 5-1 for the standard unit. Reference throughout this section will be identified as the OM20.

<b>LABELS</b>
J1 Power
J2 232/485 M&C/Terminal
J3 EIA-530 Data I/O / ES-ES Data/ Balanced G.703
J4 Ethernet (Data/M&C)
J6 Ground
J7 RX L-Band Input
J8 TX L-Band Output
J9 Compact Flash Card
J10 SD G.703 (DDI) Unbalanced, Optional ASI
J11 RD G.703 (IDO) Unbalanced, Optional ASI
J12 External Clock BNC

**Table 5-1 OM20 Connection Designations**



**Figure 5-1. OM20 Front panel ports**



**Figure 5-1A. OM20 Rear panel ports**

## 5.1.1 Power Input

### 5.1.1.1 AC Power Input (J1)

AC Input is located on connector J1 of the OM20. The auto-ranging universal power supply input allows for the connection of AC power to the port between the range of 100 – 240 VAC and 50 – 60 Hz. Power consumption for the unit is 1A (OM20) only. For the OM20, add the applicable BUC current draw to the OM20 current draw to insure that sufficient current is available for the system. An external chassis ground post is located on the OM20 (J6 GND) using a #10-32 threaded stud (Note: this is for external grounding, and should not be used to ground the AC power Source on J1). A mating power connector is supplied as standard with the unit. An optional AC power cable assembly can be ordered with the unit. This cable assembly will include up to 25 feet of 14 AWG SO Cable, terminated with the mating AC power input connector on one end. Refer to Table 5.2 for the connector Pinout.

Table 5-2. AC Power	
A	Line (L1)
B	Neutral (L2)
C	Ground

### 5.1.1.2 DC Power Input/Switch (Optional)

An Optional DC Power Input is available for the OM20. The unit may be powered from a 44 – 56 VDC source with a maximum unit power consumption of 5-2 A. This port is a 4-pin (D38999/24FC4PN) connector (mating connector supplied with the unit). Refer to Table 5.2A for the connector pinout.

Table 5-2A. DC Power	
A	– VDC
B	+ VDC
C	Ground
D	N/C

### 5.1.2 Remote/Terminal/Fault Port (J2)

This port functions as the OM20 Remote, Terminal, and Fault port utilizing an 18-Pin D38999/24FD18PN Connector (mating connector supplied with the unit). This port supports an asynchronous control protocol further described in Section 6 for Remote and Terminal operation. It may be used to support either RS-232 (Terminal) or RS485 (Remote) signal levels. The port is intended for use in computer-based remote Monitor and Control (M&C). All functions of the OM20 may be monitored and controlled from this port via a common terminal connection to the Terminal interface, or an M&C connection to the Remote interface. Selection of the port

configuration is available on the OM20 GUI. Refer to Table 5.3 for the Remote/Terminal connector pinout; and [Section 6](#) for the port interface specification.

The OM20's internal M&C system is connected to most of the circuitry on any board contained in the chassis. These connections provide status on the condition of the circuitry and provide the data required for the various measurements the OM20 provides. The on-board M&C processes this information and generates status indications and alarms when necessary. Detailed status information is available via the GUI, Remote port, and the Form-C fault connections available on this connector. This summary information can be connected to external equipment, switches, or alarms. Refer to Table 5.3 for the Form-C connector pin-outs.

<b>Table 5.3. Remote/Terminal/Fault Connector (J2)</b>			
<b>Pin No.</b>	<b>Signal Name</b>	<b>Signal</b>	<b>Direction</b>
A	Receive Data RS-232	RXD-232	Input
B	Transmit Data RS-232	TXD-232	Output
C	AGC Voltage	---	---
D	Transmit Data RS-485 (+)	TX-485-B	Output
E	Transmit Data RS-485 (-)	TX-485-A	Output
F	Receive Data RS-485 (+)	RX-485-B	Input
G	Receive Data RS-485 (-)	RX-485-A	Input
H	Ground	GND	---
J	Mod Fault – C	MF-C	---
K	Mod Fault – NC	MF-NC	---
L	Mod Fault – NO	MF-NO	---
M	Demod Fault	DF-C	---
N	Demod Fault – NC	DF-NC	---
S	Demod Fault – NO	DF-NC	---
R	Ground	GND	---
U	Default	---	---
P	Default	---	---

### 5.1.3 EIA-530 Synchronous Data, ES-ES Asynchronous Overhead Data, and G.703 Balanced Data I/O Port (J3)

This 38 Pin D38999/24FD35PN Connector contains the EIA-530 data connections (RS-422/V.35/RS-232, the ES-ES RS485 Asynchronous Overhead data interface, the G.703 Balanced interface, and the Open Collector Modulator and Demodulator Faults. Cable lengths up to 60 meters can be used depending on data rate, interface type, and temperature de-rating. Refer to Table 5.4 for pin-outs.

<b>Table 5.4. EIA-530 Synchronous Data I/O; ES-ES Async Data Connector (J3)</b>				
<b>J3 Pin No.</b>	<b>Signal Name</b>	<b>Signal</b>	<b>Direction</b>	<b>EIA-530 Std. 25 Pin Connector Reference</b>
1	Shield--- ---			1
2	Send Data B (+)	SD-B	Input	14
3	Send Data A (-)	SD-A	Input	2
4	Send Timing A (-)	ST-A	Output	15
5	Receive Data	RD-A	Output	3
6	Receive Data B (+)	RD-B	Output	16
7	Request To Send A (-)	RS-A	Input	4
8	Receive Timing A (-)	RT-A	Output	17
9	Clear To Send A (-)	CS-A	Output	5
10	Modulator Fault – Open Collector	MF	Output	18
11	Data Mode A (-)	DM-A	Output	6
12	Request To Send B (+)	RS-B	Input	19
13	Signal Ground	SGND	---	7
14	Data Terminal Ready A (-)	TR-A	Input	20
15	Receiver Ready A (-)	RR-A	Output	8
16	Demodulator Fault	DF	Output	21
17	Receive Timing B (+)	RT-B	Output	9
18	Data Mode B (+)	DM-B	Output	22
19	Receiver Ready B (+)	RR-B	Output	10
20	Data Terminal Ready B (+)	TR-B	Input	23
21	Terminal Timing B (+)	TT-B	Input	11
22	Terminal Timing	TT-A	Input	14

23	Send Timing B (+)	ST-B	Output	12
24	No Connect	---	---	25
25	Clear To Send B (+)	CS-B	Output	13

**Table 5.4.cont. EIA-530 Synchronous Data I/O; ES-ES Async Data Connector (J3)**

<b>J3 Pin No.</b>	<b>Signal Name</b>	<b>Signal</b>	<b>Direction</b>	<b>EIA-530 Std. 25 Pin Connector Reference</b>
26	Transmit Data B (ES-ES)	TXD_B	Input	N/C
27	Transmit Data A (ES-ES)	TXD_A	Input	N/C
30	Receive Data A (ES-ES)	RXD_A	Output	N/C
31	Receive Data B (ES-ES)	RXB_B	Output	N/C

**Table 5.4a. G.703 Balanced (J3)**

<b>J3 Pin No.</b>	<b>Signal Name</b>	<b>Signal</b>	<b>Direction</b>	<b>G.703 Balanced 15 Pin Connector Reference</b>
32	Send Data (-)	SD-A	Input	1
35	Receive Data A (-)	RD-A	Output	3
34	Ground	GND	---	4
33	Send Data (+)	SD-B	Input	9
36	Receive Data B (+)	RD-B	Output	11
37	Mod Fault	MOD- FLT	Open Collector Output	14
29	Demod Fault	DMD- FLT	Open Collector Output	15

### 5.1.4 ETHERNET DATA/M&C (J4)

The Ethernet Data/M&C Port (J4) is dedicated for Ethernet communications. This port is configured for 10/100 Base-T communication protocols, and can be used to Monitor & Control the unit with the GUI interface functions of the unit and/or send and receive baseband data (if equipped with the optional Ethernet data interface) The interface Complies with IEEE 802.3 and IEEE802.3u. The physical interface (J4) is a standard male RJ45 Connector. A mating RJ45 weatherproof shroud is included with the standard unit. The terminating connector number is a standard female RJ45. Ethernet cabling and connector is no included unless specified as an option at the time of order.



Use of an extended temperature CAT-5 cable such as is recommended for the Ethernet Data/M&C interface. Cat 5E Ethernet cable can support data rates up to 100 MHz (100 Base-T), easily allowing for a 20 Mbps modem data rate (this is the highest available OM20 data rate), with a typical maximum cable length of 100 meters at 20°C. Temperature de-rating of 0.4 %/°C (minimum) should be used when determining the maximum cable length for temperatures exceeding 20°C.

For a system operating at a maximum temperature of 50°C, a total maximum cable length of 88 meters should be used (100m - (0.4 x (50-20))).

Commercially available Cat 5e cable should not be used due to cable elongation during IFL installation that can cause excessive signal loss and delay, and exposure to the outdoor environment that will degrade the outer jacket of the cable exposing the inner conductors.

Since the OM20 operates outdoors, an outdoor rated CAT 5e cable such as Belden 7923A that is UV and Oil resistant with a heavy industrial grade jacket should be used. This cable can also be requested if specified and ordered with the OM20. Additionally, shielded cable such as Belden 7929A can be used where EMI issues are a concern.

### 5.1.5 Ground Lug (J6)

An external chassis ground post is located on the OM20 (J6 GND), requires a #10-32 threaded stud (Note: this is for external grounding, and should not be used to ground the AC power Source on J1

### 5.1.6 RX L-Band IF (J7)

The Receive L-Band Input Port is a 50-Ohm N-Type Female Connector that is used for the L-Band IF/DC/Reference connection to/from the LNB. The IF Frequency can be programmed from 950 to 2050 MHz in 1 Hz Steps via the GUI or Remote interface. The DC is range selectable from 13, 15, 18, or 20 VDC and can be enabled or disabled via the GUI or remote interface. The 10 MHz reference can also be enabled or disabled from the GUI or Remote interface.

### 5.1.7 TX L-Band IF (J8)

The Transmit L-Band Output Port is a 50-Ohm N-Type Female Connector that is used for the L-Band IF/DC/Reference connection to the BUC. The IF Frequency can be programmed from 950 to 2050 MHz in 1 Hz Steps via the GUI or Remote interface. The DC is range 24 VDC (optional 48VDC is available) and can be enabled or disabled via the GUI or remote interface. The 10 MHz reference can also be enabled or disabled from the GUI or Remote interface.

### 5.1.8 Compact Flash Card (J9)

The compact flash slot is located on the left side as viewed from the front of the unit behind the small weatherized panel. This must be present while the unit is operating. Files on the flash are defined by Radyne Corp.

### **5.1.9 SD (J10) (Optional)**

Based on unit configuration, this connector is used for either G.703 Unbalanced Transmit Send Data (Drop Data In) or for ASI data in depending on the optional interface ordered. The connector is a 75-Ohm Female BNC Connector.

### **5.1.10 RD (J11) (Optional)**

Based on unit configuration, this connector is used for either G.703 Unbalanced Receive Data (Insert Data Out), or for ASI data out depending on the optional interface ordered. The connector is a 75-Ohm Female BNC Connector.

### **5.1.11 LED Indicators**

There are two (2) Light Emitting Diodes (LED'S) on the front of the unit, Power and Alarm. Whenever proper AC Power is supplied to the unit and the power supply is functioning normally, this LED will be Green. If a Fault condition exists within the Power subsystem, this LED will be RED indicating that service is required.

### **5.1.12 G.703 Balanced – Connections are available via the J3 connector. Refer to Table 5.4a.**

### **5.1.13 EXT Reference J12**

The External Clock connector is optional and must be requested at time of order. This is not actually a clock, but does have some clocking implications. When the external reference is used, the master oscillator within the modem is locked to the external reference, and the internal accuracy and stability of the unit assumes that of the External Reference. Therefore, not only are the transmit frequencies locked to the external reference, but the modem's internal SCT Oscillator is locked to the external reference as well.

# Chapter 6. Web Browser/Remote Protocol

---

## 6.1 Web Browser User Interface

The Web Browser interface for OM20 can be accessed through the RJ45, SNMP port located on the unit. Instructions on how to configure the interface for this application are discussed.



### NOTE

*The Web Browser menus for the OM20 can only be accessed utilizing Microsoft Internet Explorer 6 or greater.*

---

## 6.2 Configuring Your PC

An example of a GUI layout is shown in Figure 6-1, showing the location and labeling of the Interface. The graphical user interface is designed to replicate the front panel. For users familiar with the front panel interface adjusting to the GUI interface should be seamless. The GUI Interface is divided into four functional areas: the Front Panel Display simulation, Gel-tab area, information/data entry and product information and contact area.

Hello "admin" [Introduction](#) | [Password Setup](#) | [IP Administration](#) | [Sign Out](#)

**RADYNE**  
OM20 Outdoor Modem

**MOD**  
☒ TRANSMIT ON    ☐ MAJOR ALARM  
☐ TEST MODE    ☐ MINOR ALARM

**DEMOD**  
☒ SIGNAL LOCK    ☐ MAJOR ALARM  
☐ TEST MODE    ☐ MINOR ALARM

☐ EVENT    ☐ POWER  
☐ FAULT    ☐ REMOTE

**TRANSMIT**   **RECEIVE**   **INTERFACE**   **MONITOR**   **ALARMS**   **SYSTEM**   **TEST**

TRANSMIT GENERAL / IF

Network Spec:	CLOSED NET	Strap Code:	26
Frequency (MHz):	1240.000000	Uplink Frequency (MHz):	14490.000000
Power (dBm):	-35.0	Carrier Control:	ON
Spectrum:	NORMAL	Modulation:	QPSK
Spectral Mask:	DVB SAT .35	Compensation (dBm):	0.0

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Figure 6-1. Web User Interface

### 6.2.1 Appearance

This site is a monitor and control of an individual complete satellite terminal. With a front panel look and feel, and an appearance that resembles the DMD20 layout, the product features a familiar look.

## 6.2.2 Navigation

The navigation scheme consists of gel tabs that correspond to the front panel top-level menu selections. When the mouse is dragged over a tab, it gets highlighted with a rollover effect and a sub-level of selections is revealed. These typically correspond to the front panel sub-menus, but some areas have been combined.

Below the navigation menus, a content page will show the current control scope. This will be the last user selected control page. At the top of the page, breadcrumb links remind the user how the page is selected.



The menu works as follows:

- Mousing over a global navigation link causes the corresponding subglobal division to be revealed and all other subglobal divisions to be hidden.
- Mousing off a subglobal menu link (outside a specified region x and y pixels from the top of the page), causes *all* subglobal divisions to be hidden.
- The position of the mouse is continuously being monitored.

Thus, we have a show-hide layer submenu effect.



**Table 6-1.**

Item Number	Description	Function
1	Product Name	This describes what product is that the interface is connected to.
2	Product Name/Location	This can be used by the user to identify the unit.
3	Alarm and Monitor	Displays fault status and performance monitoring of unit.
4	Gel-Tab Area	This area allows access to data and control input of unit. Moving the cursor across the Gel-Tabs drop down menus appear and allow editing of the data entry area.
5	Data Entry Area	Parameter editing is done in this area.

6	Product Information Contact Information	Access to technical trouble-shooting, product options and specifications is accomplished by selecting one and clicking on that function. Contact Radyne via Email by clicking on “Contact Us”.
---	--	--

### 6.2.3 LED Indicators

Twelve LEDs on the OM20 GUI Interface (Refer to Table 6-2) indicate the status of the OM20's operation. The LED colors maintain a consistent meaning. Green is appropriate for normal operation, Yellow means that there is a condition not proper for normal operation, and Red indicates a fault condition that will result in lost communications.



Table 6-2.		
LED	Color	Function
<b>Modem LED Indicators</b>		
Power	Green	Indicates that the unit is turned on.
Fault	Red	Indicates a hardware fault for the unit.
Event	Yellow	Indicates that a condition or event has occurred that the modem has stored in memory. The events may be viewed from the GUI or in the Terminal Mode.
Remote	Green	Indicates that the unit is in the process of updating firmware with FTP.
<b>Modulator LED Indicators</b>		
Transmit On	Green	Indicates that the Modulator transmitter is on.
Major Alarm	Red	Indicates that the Transmit Direction has failed, losing traffic.
Minor Alarm	Yellow	Indicates that a Transmit Warning Condition exists.
Test Mode	Yellow	Indicates that the transmitter is involved in a current Test Mode activity.
<b>Demodulator LED Indicators</b>		
Signal Lock	Green	Indicates that the receiver locked to an incoming carrier and data, including FEC Sync.
Major Alarm	Red	Indicates that the Receive Direction has failed, losing traffic.
Minor Alarm	Yellow	Indicates that a Receive Warning Condition exists.
Test Mode	Yellow	Indicates that the receiver is involved in a current Test Mode activity.

## 6.3 GUI Screen Menus

There are four main menus displayed on the Introduction screen upon startup of the web browser. This screen will give a brief overview of the product and contains no configurable items. The four main menus and with submenus are:

- **Introduction**
- **Password Setup**
  - Access
  - Preferences
- **IP Administration**
  - Modem Addressing
  - Configure Apps
  - Configure PC
- **Monitor and Control**
  - Transmit
  - Receive
  - Interface
  - Monitor
  - Alarms
  - System
  - Test

### 6.3.1 Introduction Menu

This menu will first appear when starting up the web browser. This page lists the general features of the unit, and lists a brief description of the unit. Notice on the bottom of the page that there are selections for Technical Specifications, Product Options, Troubleshooting, About Us, and Contact us. Access these areas for further detailed description of the selection.


**OM20 Outdoor Modem**

[Introduction](#) | [Password Setup](#) | [IP Administration](#) | [Monitor & Control](#)

Introduction /

## Introduction





### Overview

Designed for GSM, VSAT and quick deploy applications. Performance that meets or exceeds industry standards, features that provide ease of integration and operation and the ability to withstand extreme environments, the OM20 can take it!

The transmit output port will drive up to 10 Watt C-band or a 8 Watt Ku-band block converter. The OM20 has been designed and built for outdoor use in extreme environments. The OM20 serves as a stand-alone outdoor modem that can be integrated with a block up-converter and LNB for a complete outdoor system solution. The OM20 supports all the requirements needed to monitor, control and operate remote sites. Outdoor equipment such as the OM can eliminate the expense of sheltering site equipment. With the ability to support IBS, IDR and DVB standards, the OM20 covers virtually all satellite needs.

### Better All Around

The extensive list of software options allows for the deployment of an outdoor's unit with today's needs while keeping an eye toward tomorrow. Additional options and configurations can be activated in seconds via the terminal or the Web interface.

#### Highlights

- Rugged Weatherproof Construction
- Easy Installation and Configuration
- Web Browser Capabilities
- Ethernet Data Interface
- 2.4 Kbps to 20 Mbps, 1bps Steps
- BPSK/QPSK/OQPSK/8PSK/16QAM Operation
- FEC - Viterbi, Reed-Solomon, Sequential, Trellis
- Turbo Product Code
- Fully Compliant with IESS 308/309/310/314/315
- Optional DVB to EN301-210 and EN300-421
- Optional ASI Interface
- Low Power Consumption
- Built-in High-Stability Reference Oscillator and DC Voltage
- Independent Rx/Tx Control

#### Applications

Applications for the OM20 Outdoor Modem include:

- SCPC/MCPC
- Emergency Link Restoration
- Video Conferencing
- Broadcast
- Rural Telephony
- Point-of-Sales

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**Figure 6.2. Introduction Screen**



### 6.3.1.1 Login Screen

Upon initially accessing the Password Setup, IP Administration and Monitor & Control configuration menu tabs a login prompt will appear. In order to gain access to any of the configuration menus, log in with the correct user name and password. (The factory default login name is “admin” and the default password is “admin”). For further information on setting user profiles see [Section 6.2.3 IP and Application Administration Menu](#).

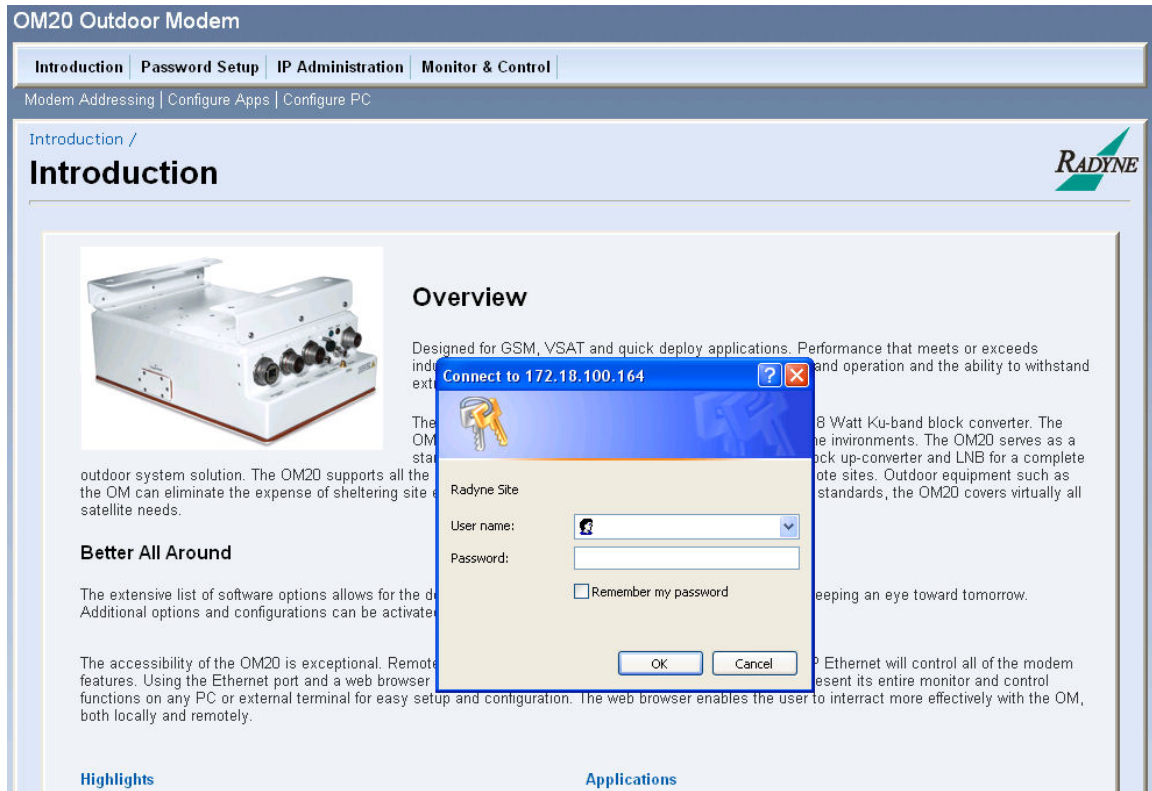


Figure 6-3. Login Screen

## 6.3.2 Password Setup

The Access Menu allows for multiple operators to be allowed access to the system. User access priorities can be set by completing the fields in the Access menu below.

### Access Menu

OM20 Outdoor Modem

Introduction Password Setup IP Administration Monitor & Control

Password Setup / Access

**Access**

Sign Out  
Hello admin

Select user, then choose new password. Click **Save** when you're done.

**Please Note:** To better protect user accounts, please make sure passwords are memorable. Do not share passwords, and never use the same passwords that have been used in the past. For security purposes, passwords should be a minimum of five characters long. A strong password contains a combination of uppercase and lowercase letters, numbers, and special characters.

Edit User:

User Access Group:

Enter User Name:

Enter a New Password:

Confirm New Password:

Technical Specifications | Product Options | Troubleshooting | About Us | Contact Us | ©2006 Radyne Corporation

**Figure 6-4. Access Menu**

<b>Edit User</b>	<b>{USER 1, USER 2, USER 3}</b> Allows the operator to assign the applicable user group.
<b>User Access Group</b>	<b>{Guest, Operator, Admin}</b> Allows the operator to assign the applicable user Access Level group.
<b>Enter User Name</b>	Allows the operator to assign the applicable user name used for login.
<b>Enter a New Password</b>	Allows the operator to assign the applicable user name password used for login.
<b>Confirm New Password</b>	Allows the operator to confirm the applicable user password (this must exactly match the previously entered Password entry for the system to accept).

## Preferences Menu

OM20 Outdoor Modem

[Sign Out](#)

[Introduction](#) | [Password Setup](#) | [IP Administration](#) | [Monitor & Control](#)

Password Setup / Preferences

### Preferences

[Sign Out](#)  
**Hello admin**  
Select the Site Preferences. Click **Save** when you're done.

**Please Note:** The user confirmation preference forces/disables confirmation of all changes through the Web-Interface. This does not override bandwidth confirmations, however. These are always enabled. Once configured, please close this session then reconnect using your browser.

**User Confirmation**

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**Figure 6-5. Modem Preferences menu**

### User Confirmation:

**{DISABLED, ENABLED}**

The user confirmation preference allows the user to force/disable confirmation of all changes through the web interface. This does not override bandwidth confirmations. However, these are always enabled.

### 6.3.3 IP and Application Administration

The Modem Addressing menu provides instructions on how to configure the modem, applications and PC.

#### 6.3.3.1 Modem Addressing

OM20 Outdoor Modem Sign Out

[Introduction](#) | [Password Setup](#) | [IP Administration](#) | [Monitor & Control](#)

IP Administration / Modem Addressing

[Sign Out](#)  
**Hello admin**

These instructions will show you how to configure the IMT. Click **Save** when you're done.

**Please Note:** Depending on which configuration settings are modified, there might be a communication loss with the unit. If the unit still resides on the same subnet as the host computer and unit is reachable, you just need to close this session then reconnect using your browser. If on the otherhand the unit is on a different network, then follow these instructions to [reconfigure](#) your computer. Once the computer network settings are modified, a restart is necessary to complete the configuration.

Server Boot Mode: NON-VOL

IP Address Mask:

Modem IP Address:

Server IP Address:

Router IP Address:

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**Figure 6-6. Modem Addressing**

**Server Boot Mode:** {DEFAULT, NON-VOL, BOOTP, IP TEST}

**Default:** All of the following parameters as shown in Table 6-3 through 6-8 will be set and will not change until the boot mode is changed.

#### IP

IPMASK:	255.000.000.000
MODEM IPADDR:	010.000.000.001
SERVER IP ADDR:	010.001.001.001
ROUTER IP ADDR:	010.000.001.001

**Table 6-3. IP Parameters**

**IP TEST:** The IP Test boot mode has a similar behavior to the default boot mode. The Terminal, IP, SNMP, FTP and Web parameters changed by the default setting will also be reset by the IP Test boot mode. However, instead of the IP addresses being set to an unreadable address, it will be set as follows as shown in Table 6-4:

#### IP TEST

IP ADDRESS MASK:	255.255.255.0
MODEM IP ADDRESS:	192.168.000.238
SERVER IP ADDRESS	192.168.000.101
ROUTER IP ADDRESS:	192.168.000.102

**Table 6-4. IP Test**

#### IP Address Mask:

**{XXX.XXX.XXX.XXX}**

The IP Address Mask of the local network. The mask is expressed in a decimal format, and must be a valid TCP/IP Mask. This field should be set before changes are made to the Modem or Router Address.

#### Modem IP Address:

**{XXX.XXX.XXX.XXX}**

The IP Address of the modem. This address should be consistent for the mask defined. This address is expressed in decimal format. Broadcast and loop back addresses will not be allowed. These are addresses with all subnet bits set to 0's or 1's.

#### Server IP Address:

**{XXX.XXX.XXX.XXX}**

The IP Address of the Boot Server and the address of the SNMP Trap Server when SNMP is active. If a server is used and there is no local router, this address must be consistent with the modem address. If a router has been specified, the address is presumed to be reachable via the router. Broadcast and loop back addresses will not be allowed. These are addresses with all subnet bits set to 0's or 1's.

#### Router IP Address:

**{XXX.XXX.XXX.XXX}**

The IP Address of the Local Network Router. If a router is present on the local network, this address must be consistent with the IP Mask and the subnet of the modem. If no router is present, then the address should be set to a foreign address. This address is expressed in decimal format. Broadcast and loop back addresses will not be allowed. These are addresses with all subnet bits set to 0's or 1's.

### 6.3.3.2 Configuring Applications

OM20 Outdoor Modem Sign Out

[Introduction](#) | [Password Setup](#) | [IP Administration](#) | [Monitor & Control](#)

IP Administration / Configure Apps **RADYNE**

**Configure Applications**

Sign Out  
Hello admin  
The following will allow you how to configure the modem Network Applications. Click **Save** when you're done.

**Please Note:** Depending on which configuration settings are modified, the host application might get limited access rights or lose communication with the unit. Please make sure your host settings are modified to match your current changes.

**SNMP Setup**

SNMP Version:  
V1 & V2

Trap Version:  
V1

Authorization:  
TRAPS OFF

Read Community:  
public

Read/Write Community:  
public

**FTP Setup**

User ID:  
User

Password:  
Password

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**Figure 6-7. Configuring Applications**

#### SNMP Setup:

<b>SNMP Version:</b>	{ V1 & 2, V3} Default = V1 & V2
<b>Trap Version:</b>	{ V1 & 2} Default = V1
<b>Authorization:</b>	{ TRAPS ON, TRAPS OFF} Default = TRAPS OFF
<b>Read Community:</b>	{Public} Default
<b>Read/Write Community:</b>	{Public} Default

#### FTP Setup:

<b>UserID:</b>	User
<b>Password:</b>	Password

**SNMP**

SNMP VERSION: V1 & V2			
TRAP VERSION: V1			
AUTHORIZATION: TRAPS OFF			
RD COMMUNITY: PUBLIC			
RDWR COMMUNITY: PUBLIC			
USER 1 Viewer-md5	USER 2 Viewer-sha	USER 3 Oper-md5	USER 4 Oper-sha
ACCESS GROUP VIEWER	ACCESS GROUP VIEWER	ACCESS GROUP OPER	ACCESS GROUP OPER
AUTH PASSWORD Viewer	AUTH PASSWORD Viewer	AUTH PASSWORD Oper	AUTH PASSWORD Oper
PRIV PASSWORD Viewer	PRIV PASSWORD Viewer	PRIV PASSWORD Oper	PRIV PASSWORD Oper
AUTHENTICATION MD5	AUTHENTICATION SHA	AUTHENTICATION MD5	AUTHENTICATION SHA
PRIVACY DES	PRIVACY DES	PRIVACY DES	PRIVACY DES

**Table 6-5. SNMP Parameters****FTP**

USER ID:	USER
PASSWORD:	PASSWORD

**Table 6-6. FTP Parameters****WEB**

Confirmation: disabled		
USER 1 guest	USER 2 oper	USER 3 admin
ACCESS GROUP guest	ACCESS GROUP oper	ACCESS GROUP admin
AUTH PASSWORD guest	AUTH PASSWORD oper	AUTH PASSWORD admin

**Table 6-7. Web Parameters**

**TERMINAL AND REMOTE PORT**

Type	VT100
baud rate	19200
interface	rs232
remote control	terminal

**Table 6-8. Terminal and Remote Port Parameters**

**NON-VOL:** Stores and uses IP Mask and addresses as provided by the user.

**BOOTP:** At boot time, use Bootp Protocol to get names, masks, and IP Addresses of the modem, router, and server.



## Configuring the PC

**OM20 Outdoor Modem** Sign Out

[Introduction](#) | [Password Setup](#) | [IP Administration](#) | [Monitor & Control](#)

IP Administration / Configure PC **RADYNE**

**Configure the PC**

[Sign Out](#)  
**Hello admin**  
These instructions will show you how to configure your computer.

**Please Note:** The following instructions apply only to Windows 2000 or XP using the Classic interface (in which the icons and menus look like previous Windows versions).

**Step1**  
Click the Start button. Select Settings and Click the Control Panel icon. Double-click the Network and Dial-up Connection icon.

**Step2**  
Select the Local Area Connection icon for the applicable Ethernet adapter (usually it is the first Local Area Connection listed). Double-click the Local Area Connection. Click the Properties button.

**Local Area Connection Status**

General | Support

Connection  
Status: Connected  
Duration: 5 days 01:27:21  
Speed: 100.0 Mbps

Activity

Sent — Received

Packets: 674,202 | 755,099

Properties Disable

**Step3**  
Make sure the box next to Internet Protocol (TCP/IP) is checked. Highlight Internet Protocol (TCP/IP), and click the Properties button.

**Local Area Connection Properties**

General | Authentication | Advanced

Connect using:  
Intel(R) PRO/100 VE Network Connection Configure...

This connection uses the following items:

- ☒ Client for Microsoft Networks
- ☒ File and Printer Sharing for Microsoft Networks
- ☒ QoS Packet Scheduler
- ☒ Internet Protocol (TCP/IP)

Install... Uninstall Properties

**Step4**  
Select Obtain an IP address automatically if your network supports this capability and all generated IP addresses will be on the same subnet as the unit. Select 'Use the following IP address' otherwise. Once the new window appears, click the OK button again to complete the PC configuration, then restart your computer.

**Internet Protocol (TCP/IP) Properties**

General | Alternate Configuration

You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.

☒ Obtain an IP address automatically

☐ Use the following IP address:

IP address:   
Subnet mask:   
Default gateway:

☒ Obtain DNS server address automatically

☐ Use the following DNS server addresses:

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**Figure 6-8. Configuring the PC**

## 6.3.4 Monitor and Control Menu

Under this menu, all modem functions that are monitored and/or controlled are accessible. To access the M&C sub menu options drag the cursor across the gel-tabs. Note that as the cursor passes over a tab it is highlighted and a menu drops below the tab. Stop on the desired tab move the cursor down and then across to the desired function. Select the desired sub menu function and the data entry menu will appear in the data entry section allowing for adjustments to the parameters displayed.

### 6.3.4.1 Transmit Menu

The Transmit menu contains sub menus; General/IF, Data, Reed Solomon, ODU-BUC and AUPC.

#### General / IF Menu

The screenshot displays the OM20 Outdoor Modem web interface. At the top, it says "Hello 'admin'" and provides navigation links: "Introduction | Password Setup | IP Administration | Sign Out". Below this is a status bar with the "RADYNE" logo and "OM20 Outdoor Modem". A row of status indicators is shown, including "MOD" (TRANSMIT ON, TEST MODE, MAJOR ALARM, MINOR ALARM) and "DEMOD" (SIGNAL LOCK, TEST MODE, MAJOR ALARM, MINOR ALARM), along with "EVENT", "POWER", "FAULT", and "REMOTE". A row of tabs includes "TRANSMIT", "RECEIVE", "INTERFACE", "MONITOR", "ALARMS", "SYSTEM", and "TEST". The "TRANSMIT" tab is selected, showing the "TRANSMIT GENERAL / IF" sub-menu. This sub-menu contains two columns of parameters: "Network Spec" (CLOSED NET, Frequency (MHz): 1240.000000, Power (dBm): -35.0, Spectrum: NORMAL, Spectral Mask: DVB SAT .35) and "Strap Code" (26), "Uplink Frequency (MHz): 14490.000000", "Carrier Control: ON", "Modulation: QPSK", and "Compensation (dBm): 0.0". At the bottom, there are links for "Technical Specifications", "Product Options", "Troubleshooting", "About Us", "Contact Us", and a copyright notice for "©2006 Radyne Corporation".

**Figure 6-9. General | IF Menu**

**Network Spec:** {CLOSED NET, IDR, IBS, DROP & INSERT, DVB SAT}  
*Used with IDR, or IBS Interface Only.*  
 The Network Spec Command sets a number of parameters within the modem to meet a set specification. The purpose is to eliminate keystrokes and potential compatibility problems.

Additionally, data rates not covered by the given network specification of operation will not be allowed. If the mode of operation is selected after the data rate has been entered, then the data rate must be compatible with the desired mode of operation or the mode will not be allowed. The following parameters are set and cannot be changed while the unit is in the given mode of operation:

**IDR:**

(IESS-308)

For Data rates 1.544, 2.048, 6.312, 8.448 Mbps

Framing Type: 96 Kbps (IDR)

Scrambler Type: V.35

Spectrum Mask: Intelsat

For Data Rates &lt; 1.544

Framing Type: 1/15 (IBS)

Scrambler Type: IESS-309

Spectrum Mask: Intelsat

**IBS:**

(IESS-309)

For Data Rates  $\leq$  2048

Framing Type: 1/15 (IBS)

Scrambler Type:

IESS-309

Spectrum Mask: Intelsat

**Drop & Insert:**Data Rates:  $n \times 64 \text{ n} = 1, 2, 3, 4, 5, 6, 8, 10, 12, 15, 16, 20, 24, 30$ 

Framing Type: 1/15 (IBS)

Scrambler Type: IESS-309

Spectrum Mask: Intelsat

**DVB:**

Data Rates: All Rates

Framing Type: DVB

Scrambler Type: DVB

Spectrum Mask: DVB 0.25, 0.35

**Closed Net:**

All possible combinations allowed, however, DVB settings requires the DVB network spec. Activates the AUPC Menu.

**Strap Code:****{Refer to Strap Code Guide, Table G-1}**

The Strap Code is a quick set key that sets many modem parameters. Consult the strap code guide for available strap codes. Parameters set by strap code:

## Data Rate

Inner Code Rate  
 Satellite Framing  
 Scrambler  
 Drop and Insert  
 Outer Code Rate (Reed-Solomon)  
 Modulation  
 Network Spec

<b>Frequency (MHz):</b>	Allows the user to enter the Modulator IF Output Frequency of the modem in 1 Hz increments.
<b>Uplink Frequency (MHz):</b>	Displays the output frequency of the BUC also referred to as Satellite uplink frequency. The Radyne technician must enter the BUC LO and OSC SIDE BAND before using this menu. The UPLINK FREQUENCY is a calculated measurement of both the BUC LO and OSC SIDE BAND. Once the menus are entered correctly, the user can control the uplink Frequency from this menu.
<b>Power (dBm):</b>	<b>{-20 to -45 dBm}</b> Allows the user to enter the Transmitter Power Level.
<b>Carrier Control:</b>	<b>{ON, OFF, AUTO, VSAT, RTS}</b> Allows the user to select the carrier type. Refer to Appendix C for further information.
<b>Spectrum:</b>	<b>{Normal, Inverted}</b> Allows the user to invert the direction of rotation for PSK Modulation. Normal meets IESS Specification. Spectral inversion may be required if the BUC LO is higher in frequency than the BUC output frequency. This creates a spectral inversion and the IF spectrum must be again inverted to compensate.
<b>Modulation:</b>	<b>{QPSK, BPSK, OQPSK, 8PSK, 16QAM}</b> Allows the user to select the modulation type.
<b>Spectral Mask:</b>	<b>{Intelsat 0.35, DVB SAT 0.35, DVB SAT 0.25}</b> Allows the user to set the spectral shape of Tx Data Filter
<b>Compensation:</b>	<b>{0.0 – 1.0}</b> Allows you to offset output power by up to 1 dbm. This is intended as a correction for user cabinet connectors.

## Data Menu

Hello "admin" Introduction | Password Setup | IP Administration | Sign Out

**OM20 Outdoor Modem**

**MOD**  
☒ TRANSMIT ON ☐ MAJOR ALARM  
☐ TEST MODE ☐ MINOR ALARM

**DEMOD**  
☒ SIGNAL LOCK ☐ MAJOR ALARM  
☐ TEST MODE ☐ MINOR ALARM

☐ EVENT ☐ POWER  
☐ FAULT ☐ REMOTE

**TRANSMIT** **RECEIVE** **INTERFACE** **MONITOR** **ALARMS** **SYSTEM** **TEST**

**TRANSMIT / DATA**

Data Rate (bps): 2048000  
 Inner Fec: VIT 1/2  
 TPC Interleaver: ENABLED  
 Scrambler Selection: V.35 (IESS)  
 Satellite Framing: NONE  
 Data Polarity: INVERT NONE  
 Esc Overhead: DATA 64KBPS  
 Scc Inband Rate: 300

Symbol Rate (sps): 2048000  
 Differential Coding: DISABLED  
 Scrambler Control: ENABLED  
 Terrestrial Framing: NONE  
 Symbol Pair: NORMAL  
 Scc Control Ratio: 1/1  
 Async Inband Rate: 150

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**Figure 6-10. Data Menu**

**Data Rate (bps):** {Refer to Technical Specs for Data Rates}  
 Allows the user to set the Data Rate in bps steps.

**Symbol Rate (sps):** Allows the user to view the Symbol Rate.

**INNER FEC**

<b>Viterbi</b>	{1/2, 3/4, 7/8, None}
<b>Optional FEC Rates:</b>	
<b>Sequential</b>	{1/2, 3/4, 7/8}
<b>Trellis 8PSK</b>	{2/3}
<b>Turbo ≤ 5 Mbps</b>	{.793, .495}
<b>Turbo ≤ 20Mbps</b>	{1/2, 3/4, 7/8}
<b>Comstream Seq</b>	{3/4}
<b>DVB VIT</b>	{1/2, 2/3, 3/4, 5/6, 7/8}
<b>DVB Trellis</b>	{2/3, 5/6, 8/9}

Allows the user to select the Tx Code Rate and Type

**TPC Interleaver:** {DISABLE, ENABLE}  
 Allows user to disable or enable the TPC Interleaver. Valid only for Radyne turbo codes TPC.495 and TPC.793

<b>Differential Coding:</b>	<b>{ENABLED, DISABLE}</b> Allows the user to enable or disable the Differential Encoder. Having the encoder enabled ensures proper phase lock. May not be adjustable in some modes.
<b>Scrambler Selection:</b>	<b>{NONE, V.35-IESS, V.35 CITT, V.35 EF, IBS w/Optional Framing and optional Reed-Solomon, Reed-Solomon Scrambler w/Optional Framing, CCITT, V.35FC, OM-73, V.35EF_RS, TPC, DVB, EDMAC}</b> Allows the user to select the descrambler type.
<b>Scrambler Control:</b>	<b>{ENABLED, DISABLE}</b> Allows the user to enable or disable scrambler operation.
<b>Satellite Framing:</b>	<b>{1/15 (IBS), 1/15 (Async), 96 Kbps (IDR), DVB, EDMAC, EFAUPC, SCC, None}</b> <i>Used with IDR, IBS, or Asynchronous Interface Only.</i> Allows the user to select the framing type.
<b>Terrestrial Framing:</b>	<b>{NONE, 188, 204} DVB Only</b>
<b>Data Polarity:</b>	<b>{INV. TERR &amp; BASE, INV. BASEBAND, INV.TERR DATA, NONE}</b> Allows the user to invert the Tx Data polarity.
<b>Symbol Pair:</b>	<b>{NONE, SWAPPED}</b> Allows the user to swap the I & Q Channels. <b>(BPSK Mode Only)</b>
<b>ESC Overhead:</b>	<b>{VOICE X2, DATA 64KBPS}</b> IDR ESC Channel used for Voice or 64 K data channel.
<b>SCC Control Ratio:</b>	<b>{1:1,1:2, 1:3, 1:4, 1:5, 1:6, 1:7}</b> <b>This function is only available when Tx Satellite Framing is set to SCC.</b> Allows the user to simulate the framing used by the Satellite Control Channel Option. Allows the user to set the ratio of overhead in-band data to synchronizing words.
<b>SCC Inband Rate:</b>	<b>{300 to 115200}</b> <b>This function is only available when Tx Satellite Framing is set to SCC.</b> Allows the user to request the rate of in-band data for the overhead channel.

**Async Inband Rate:** {75, 150, 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200}

Allows the user to select the async inband rate.

{150 – 1024} For IBS ES to ES

{150 – 19200} For ES to ES Enhanced

{150 – 115200} For SCC Communications

## Reed-Solomon Menu

These selections are active only when the Reed-Solomon Option is installed.

The screenshot shows the web interface of the OM20 Outdoor Modem. At the top, it says 'Hello "admin"' and has links for 'Introduction | Password Setup | IP Administration | Sign Out'. Below this is a status bar with 'RADYNE OM20 Outdoor Modem' and several indicator lights for MOD (TRANSMIT ON, TEST MODE, MAJOR ALARM, MINOR ALARM) and DEMOD (SIGNAL LOCK, TEST MODE, MAJOR ALARM, MINOR ALARM). There are also indicators for EVENT, POWER, FAULT, and REMOTE. Below the status bar is a main menu with buttons for TRANSMIT, RECEIVE, INTERFACE, MONITOR, ALARMS, SYSTEM, and TEST. The TRANSMIT button is highlighted. The TRANSMIT / REED-SOLOMON menu is open, showing 'Reed-Solomon Control' set to 'DISABLED', 'Interleaver Depth' set to '4', and 'Reed-Solomon Rate' with 'N Value' 194 and 'K Value' 178. A 'Submit N&K' button is at the bottom of the rate section. The footer contains links for 'Technical Specifications | Product Options | Troubleshooting | About Us | Contact Us' and '©2006 Radyne Corporation'.

**Figure 6-11. Reed-Solomon Menu**

**Reed-Solomon Control:** {ENABLED, DISABLE}  
Allows the user to Enable/Disable the Reed-Solomon Encoder.

**Reed-Solomon Rate  
N Value, K Value:** {Refer to Table 3-1 for valid N/K values}  
Displays the currently used n, k Reed-Solomon Codes. In Closed Net Mode, the user may select custom R-S Codes.

**Interleaver Depth:** {4, 8, 12}  
Allows the user to select the Reed-Solomon interleaver depth. In Closed Net Mode, a depth of 4, 8 or 12 may be selected.



## ODU BUC Menu

Hello "admin" Introduction | Password Setup | IP Administration | Sign Out

**OM20 Outdoor Modem**

**MOD**  
☒ TRANSMIT ON ☐ MAJOR ALARM  
☐ TEST MODE ☐ MINOR ALARM

**DEMOD**  
☒ SIGNAL LOCK ☐ MAJOR ALARM  
☐ TEST MODE ☐ MINOR ALARM

☐ EVENT ☐ POWER  
☐ FAULT ☐ REMOTE

**TRANSMIT / ODU-BUC**

LO Frequency (MHz): 13250.000000  
 Carrier Delay (sec): 0  
 Low Alarm Thrsh (Volts): 0.0  
 High Alarm Thrsh (Volts): 52.0

Osc Side Band: LOW SIDEBAND  
 10 MHz BUC Reference: ENABLED  
 Low Alarm Thrsh (Amps): 0.00  
 High Alarm Thrsh (Amps): 4.00  
 BUC Voltage: DISABLED

**FSK**  
 FSK Comms: OFF/NONE  
 BUC Address: 0  
 PassThru Command: NO CMD  
 NO REPLY

FSK Test: NONE  
 Test Status: PASS  
 BUC Output: DISABLED

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**Figure 6-12. OBU-BUC menu**

**LO Frequency (MHz):** Allows the user to enter the Local Oscillator frequency of the BUC LO in order for the uplink frequency to be displayed correctly (refer to the BUC manufacturer's specifications).

**NOTE:** When utilizing BUC that supports FSK, the modem will display LO frequency as stated by the BUC.

**Carrier Delay (sec):** {0 to 255}  
 Allows the user to select the time delay after power-up before the Tx Carrier may be enabled. This allows time for the BUC to stabilize.

**OSC Side Band:** {LOW SIDEBAND, HIGH SIDEBAND}  
 Allows the user to select the location of the BUC LO. The user must enter the location of the BUC LO in order for the UPLINK FREQUENCY to be displayed correctly. The BUC LO can be either higher or lower in frequency than the BUC output



frequency. If the BUC LO is higher in frequency then the user must enter HIGH SIDEBAND.

<b>10 MHz BUC Reference:</b>	<b>{ENABLED, DISABLED}</b> Allows the user to enable or disable the 10 MHz BUC reference clock.
<b>Low Alarm Thrsh (Volts)</b>	This menu allows the user to establish the lower voltage threshold limit of the BUC. If voltage falls below this limit, an alarm will flash.
<b>High Alarm Thrsh (Volts)</b>	This menu allows the user to establish the upper voltage threshold limit of the BUC. If voltage exceeds the upper limit, an alarm will flash.
<b>Low Alarm Thrsh (Amps)</b>	This menu allows the user to establish the lower Amp/current threshold limit of the BUC. If current falls below this limit, an alarm will flash.
<b>High Alarm Thrsh (Amps)</b>	This menu allows the user to establish the upper Amp/current threshold limit of the BUC. If current exceeds the upper limit, an alarm will flash.
<b>BUC Voltage:</b>	<b>{ENABLED, DISABLED}</b> Allows the user to enable or disable the BUC supply voltage.



**IMPORTANT**

*The following menus are for BUCs that support FSK command structure. If user enables the FSK and the BUC does not support FSK, the modem will display a fault or if the user selects the incorrect manufacturers BUC, the unit will display a fault.*

<b>FSK COMMS</b>	<b>{OFF-NONE/CODAN/TERRASAT/AMPLUS}</b> <b>(Only available when the FSK Comm is Enabled)</b>
------------------	---

**OFF/NONE:**

Will disable the FSK Communication link. User must select this option if the BUC does not support FSK or if the customer does not want to utilize the FSK option.

**CODAN:**

Enables the FSK Communication link for CODAN BUCs only. This feature enables the DMD20LBST to retrieve and display certain BUC parameters on the front panel of the modem.

**TERRASAT:**

Enables the FSK communication link for Terrasat BUCs only. This feature enables the DMD20LBST to retrieve and display certain BUC parameters on the front panel of the modem.

**AMPLUS:**

Enables the FSK communication link for AMPLUS BUCs only. This feature enables the DMD20LBST to retrieve and display certain BUC parameters on the front panel of the modem.

**BUC ADDRESS**

**{xxxx}**

Allows the user to enter the BUCs address for FSK communications. Modem may be able to retrieve address through the FSK Query for Address Test menu.

**BUC OUTPUT**

**{ENABLED, DISABLED}**

Allows the modem to enable and disable the output of the BUC via FSK command

**FSK TEST**

**{NONE/LOOPBACK/CYCLE TX ENABLE/QUERY FOR ADDRESS/PASS THRU}**

**(Only available when the FSK Comm is Enabled)**

**NONE:**

This is the none FSK operational mode.

**LOOPBACK:**

The FSK will initiate an internal loopback test of the FSK transmitter and receiver verifying that the modem communication link is functioning properly.

**CYCLE TX ENABLE:**

The modem will initiate a test of the FSK between the modem and BUC. The LBST will enable and disable the BUC RF output and verify that the commands are properly received and accepted by the BUC and the modem. If communications are lost, LBST will initiate a fault.

## QUERY FOR ADDRESS

The modem will initiate a FSK query requesting BUC address.

## PASS THRU:

Allows the user to communicate with the BUC utilizing the BUCs message protocol

## AUPC Menu

These selections are visible only when the AUPC Option is installed.

OM20 Outdoor Modem

TRANSMIT / AUPC

**LOCAL**

Mode:

Min Power (dBm):

Target EbNo (dB):

Local CL Action:

Nominal Power (dBm):

Max Power (dBm):

Tracking Rate:

Remote CL Action:

**REMOTE**

Mode:

TX 2047 Pattern:

Remote EbNo (dB):

Loopback:

Remote BER:

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**Figure 6-13. Aupc Menu**

**Local Mode:** The 'LOCAL AUPC CONFIGURATION' Menu contains the local configuration parameters for the AUPC Function.

### MODE

{DISABLED, NEAR SIDE, RADYNE, EFDATA}

**DISABLED:** Allows the user to enable or disable the Local AUPC Function of the local modem.

**EFDATA:** Enables EFDATA Local AUPC Function. In the event that the remote or local demodulator losses lock, the output power level will adjust itself to the level settings indicated in the 'REMOTE CL ACTION' Menu or the 'LOCAL CL ACTION'.

**RADYNE:** Enables Radyne Local AUPC Function. In the event the remote demodulator losses lock, the local output power level will adjust itself to the nominal level. This nominal power should be set to a level high enough to re-establish communications regardless of rain fade.

**NEAR SIDE:** Enables NEAR SIDE Local AUPC function. In the event the local demodulator losses lock due to signal loss, the output power level will adjust itself to the nominal level. This nominal power should be set to a level high enough to re-establish communications regardless of rain fade.

**NOMINAL TX POWER****{-20 TO -45 dB}**

This allows the user to set the nominal Transmit Power. The nominal transmit power is the default output power level.

**MINIMUM TX POWER****{-20 to -45 dB}**

This allows the user to set the minimum Transmit Power.

**EFDATA AUPC:** When configured for EFDATA AUPC the minimum Transmit Power is the lowest power setting that will be used when the local modem commands a decrease of the Transmit Power from the Remote modem.

**RADYNE:** When configured for Radyne AUPC, the minimum Transmit Power is the lowest power setting that will be used when the remote modem commands a decrease of the Transmit Power from the Local modem.

**NEAR SIDE:** When configured for NEAR SIDE AUPC the minimum Transmit Power is the lowest power setting that will be used by the local modem when the Eb/No increases above the Eb/No target.

**MAXIMUM TX POWER****{-20 to -45 dB}**

This allows the user to set the maximum Transmit Power.

**EF AUPC:** When configured for EF AUPC, the maximum Transmit Power is the highest power setting that the local modem will use when the local modem commands an increase in Transmit power from the Remote modem.

**RADYNE:** When configured for Radyne AUPC, the maximum Transmit Power is the highest power setting that will be used when the remote modem commands an increase of the Transmit Power from the Local modem

	<p><b>NEARSIDE:</b> When configured for NEARSIDE AUPC the maximum Transmit Power is the highest power setting that will be used by the local modem when the <math>E_b/N_o</math> decreases below the <math>E_b/N_o</math> target.</p>
<b>TARGET <math>E_b/N_o</math></b>	<p><b>{4.0 to 16 dB}</b></p> <p>This allows the user to set the desired <math>E_b/N_o</math> for the local receiver.</p> <p><b>RADYNE AUPC:</b> When configured for Radyne AUPC, this setting is compared against the remote <math>E_b/N_o</math> and commands to the local modem to increase or decrease the local transmit power.</p> <p><b>EF AUPC:</b> When configured for EF AUPC, this setting is compared against the local received <math>E_b/N_o</math> and commands to the remote modem to increase or decrease transmit power.</p> <p><b>NEARSIDE:</b> When configured for NEARSIDE AUPC, this setting is compared against the received <math>E_b/N_o</math> of the local modem and commands to the local modem to increase or decrease transmit power.</p>
<b>TRACKING RATE</b>	<p><b>{0.5 to 6.0}</b></p> <p>Allows the user to set the rate at which the commands to increase or decrease Transmit Power are sent. Each command will result in a 0.5 dB increase or decrease in Transmit Power from the remote transmitter. The tracking rate is adjustable from 0.5 dB per minute to 6.0 dB per minute in 0.5 dB steps. <b>(Only available when EFAUPC is selected as the framing)</b></p>
<b>LOCAL CL ACTION</b>	<p><b>{HOLD, NOMINAL, MAXIMUM}</b></p> <p>This allows the user to set the Remote Transmit Power Setting to be used when the local modem receiver loses lock. The setting can be 'HOLD' (no action taken), 'NOMINAL' (the nominal Transmit Power Setting is used), and 'MAXIMUM' (the maximum Transmit Power Setting is used). <b>(Only available when EFAUPC is selected as the framing)</b></p>
<b>REMOTE CL ACTION</b>	<p><b>{HOLD, NOMINAL, MAXIMUM}</b></p> <p>This allows the user to set the Local Transmit Power Setting to be used when the remote modem receiver loses lock. The setting can be 'HOLD' (no action taken), 'NOMINAL' (the nominal Transmit Power Setting is used), and 'MAXIMUM' (the maximum Transmit Power Setting is used).</p>
<b>REMOTE AUPC (menu)</b>	<p>The 'REMOTE AUPC CONFIGURATION' Menu contains the remote configuration parameters for the AUPC Function. Remote AUPC menus are only available when modem is configured for EF AUPC</p>

**AUPC MODE****{DISABLE,NEAR SIDE, EFDATA}**

Allows the user to enable or disable the AUPC Function of the remote modem. The remote AUPC Function is the response of the local modem to commands for an increase or decrease of the Transmit Power in 0.5 dB steps and the command to change to the setting indicated in the 'REMOTE CL ACTION' Menu of the remote modem upon receiver loss of lock.

**LOOPBACK****{DISABLE, ENABLE}**

Allows the user to enable or disable the Baseband Loopback Test Mode of the remote modem.

**TX 2047 TEST****{DISABLE, ENABLE}**

Allows the user to enable or disable the Transmit 2047 Pattern Test Mode of the remote modem.

**RX 2047 BER:**

Reports the BER measurement of the receiver 2047 Pattern Test Mode of the remote modem. BER is reported from the  $1 \times 10^{-5}$  to  $1 \times 10^{-7}$  in tenth decade steps.

if the pattern does not synchronize or is out of range, 'NO DATA' will be displayed.

**IMPORTANT**

*When modems are configured for Radyne AUPC, the remote Eb/No will be displayed in the Monitor Menus.*

### 6.3.4.2 Receive Menu

The Receive menu contains sub menus; General | IF, Data, Reed Solomon and ODU-LNB.

#### General | IF Configuration Menu

The screenshot shows the OM20 Outdoor Modem web interface. At the top, it says "Hello 'admin'" and "Introduction | Password Setup | IP Administration | Sign Out". Below this is the "OM20 Outdoor Modem" header with the RADYNE logo. A status bar shows various indicators: MOD (TRANSMIT ON, TEST MODE, MAJOR ALARM, MINOR ALARM), DEMOD (SIGNAL LOCK, TEST MODE, MAJOR ALARM, MINOR ALARM), and EVENT (EVENT, FAULT, POWER, REMOTE). Below the status bar are tabs for TRANSMIT, RECEIVE, INTERFACE, MONITOR, ALARMS, SYSTEM, and TEST. The "RECEIVE GENERAL / IF" sub-menu is selected. The main configuration area contains two columns of settings:

Network Spec:	CLOSED NET	Strap Code:	26
Frequency (MHz):	960.000000	Downlink Frequency (MHz):	10960.000000
Spectrum:	NORMAL	Modulation:	QPSK
Spectral Mask:	INTELSAT.35	Sweep Range (+/-KHz):	25
Sweep Delay (sec):	0.5	Reacquisition Range (+/-Hz):	500
Adj Carrier Power:	NORMAL	Fast Acquisition:	ENABLED
Carrier Input Level Limit:	-71	Eb/No Alarm Thrsh:	1.0

At the bottom, there are links for Technical Specifications, Product Options, Troubleshooting, About Us, Contact Us, and a copyright notice for ©2006 Radyne Corporation.

**Figure 6-14. General | IF Configuration**

#### Network Spec:

**{IDR, IBS, DROP & INSERT, CLOSED NET, DVB SAT}**  
*Used with IDR, or IBS Interface Only.*

The Mode Command sets a number of parameters within the modem to meet a set specification. The purpose is to eliminate keystrokes and potential compatibility problems. Additionally, data rates not covered by the given mode of operation will not be allowed. If the mode of operation is selected after the data rate has been entered, then the data rate must be compatible with the desired mode of operation or the mode will not be allowed. The following parameters are set and cannot be changed while the unit is in the given mode of operation:

#### **IDR:**

(IESS-308)

For Data rates 1.544, 2.048, 6.312, 8.448 Mbps

Framing Type: 96 Kbps (IDR)

Descrambler type: V.35

Spectrum Mask: Intelsat

For Data Rates < 1.544 Mbps

Framing Type: 1/15 (IBS)

Descrambler Type: IESS-309

Spectrum Mask: Intelsat

***IBS:***

(IESS-309)

For Data Rates  $\leq$  2.048 Mbps

Framing Type: 1/15 (IBS)

Descrambler Type: IESS-309

Spectrum Mask: Intelsat

***Drop & Insert:***

Data Rates:  $n \times 64$ ,  $n = 1, 2, 3, 4, 5, 6, 8, 10, 12, 15, 16, 20, 24, 30$

Framing Type: 1/15 (IBS)

Descrambler Type: IESS-309

Spectrum Mask: Intelsat

***DVB:***

Data Rates: All Rates

Framing Type: DVB

Scrambler Type: DVB

Spectrum Mask: DVB 0.25, 0.35

***Closed Net:***

All possible combinations allowed, however, DVB settings requires the DVB network spec.

**Strap Code:**

The Strap Code is a quick set key that sets many modem parameters. Consult the strap code guide for available strap codes. Parameters set by strap code:

Data Rate

Inner Code Rate

Satellite Framing

Scrambler

Drop and Insert

Outer Code Rate (Reed-Solomon)

Modulation

Network Spec

**Frequency (MHz):**

**{950 – 2050 MHz}**

Allows the user to enter the Modulator IF Frequency in 1 Hz increments.



**Downlink Frequency (MHz):** Displays the input frequency into the LNB from the satellite, also referred known as Satellite downlink frequency. The user must enter the LNB LO and OSC SIDEBAND of the LNB before using this menu. The DOWNLINK FREQUENCY is a calculated measurement of both the LNB LO and OSC SIDE BAND. Once the menus are entered correctly, the user can control the downlink Frequency from this menu.

**Spectrum:** {Normal, Inverted}  
Allows the user to invert the direction of rotation for PSK Demodulation. Normal meets IESS Specification.



## NOTE

*Spectral inversion may be required if the LNB LO is higher in frequency than the LNB input frequency from the satellite. When LNB LO is higher in frequency than the LNB input frequency, this creates a spectral inversion and the IF Spectrum must be inverted to compensate.*

**Demodulation:** {QPSK, BPSK, OQPSK, 8PSK, 16QAM}  
Allows the user to select the demodulation type.

**Spectral Mask:** {Intelsat 0.35, DVB 0.35, DVB 0.25}  
Allows the user to invert the direction of rotation for PSK Modulation. Normal meets the IESS Specification.

**Sweep Range (kHz):** {±0 to 255 kHz}  
Allows the user to set the acquisition range for the demodulator

**Sweep Delay (sec):** {0.0 – 900.0 sec}  
Allows the user to set the reacquisition delay time in 1/10<sup>th</sup> second increments.

**Reacquisition Range (Hz):** {0 – 32000 Hz}  
Allows the user to set the reacquisition sweep in 1 Hz increments.

**Adj Carrier Pwr:** {Normal, Suppressed}  
Allows the user to indicate adjacent carrier as Normal or Suppressed (High Power). Unit will increase or decrease post dissemination gain appropriately.

**Fast Acquisition:** {DISABLED, ENABLED}  
Allows the user to disable or enable the Rx fast acquisition capability.



## NOTE

### Limitations of Fast Acquisition:

*The maximum symbol rate for Fast Acquisition is 1028Ksps.  
Fast Acquisition must be disabled for rates greater than 1028Ksps.  
Only supports QPSK and 8PSK in a NON-DVB MODE.  
Does not support spectral inversion applications.*

### Carrier Input Level Limit: {-30 to 90 dBm}

Allows the user to adjust the low level threshold limit for input power. Input power level below the threshold limit will trigger a major alarm on the demodulator.

### EB/NO Alarm Thrsh

{0.0 to 9.90 dB}

Allows the user to set the desired  $E_b/N_0$  for the local receiver. This setting is compared against the receive  $E_b/N_0$  and commands to the remote modem to increase or decrease Transmit Power accordingly are sent.

## Data Menu

Hello "admin" Introduction | Password Setup | IP Administration | Sign Out

**RADYNE**  
OM20 Outdoor Modem

MOD: TRANSMIT ON (green), TEST MODE (grey), MAJOR ALARM (grey), MINOR ALARM (yellow)

DEMOM: SIGNAL LOCK (green), TEST MODE (yellow), MAJOR ALARM (grey), MINOR ALARM (grey), EVENT (yellow), FAULT (grey), POWER (green), REMOTE (grey)

TRANSMIT RECEIVE INTERFACE MONITOR ALARMS SYSTEM TEST

RECEIVE / DATA

Data Rate (bps):	2048000	Symbol Rate (sps):	2048000
Inner Fec:	VIT 1/2	Rot.Ambiguity:	0 (0.0.0)
TPC Interleaver:	ENABLED	Differential Coding:	ENABLED
Scrambler Selection:	V.35 (IESS)	Scrambler Control:	ENABLED
Satellite Framing:	NONE	Terrestrial Framing:	NONE
Data Polarity:	INVERT NONE	Symbol Pair:	NORMAL
Esc Overhead:	DATA 64KBPS	Scc Control Ratio:	1/1
Scc Inband Rate:	300	Async Inband Rate:	150

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Figure 4-15. Data Menu

<b>Data Rate (bps):</b>	<b>{Refer to Technical Specs for Data Rates}</b> Allows the user to set the Data Rate in bps steps via the Front Panel Arrows or Keypad.
<b>Symbol Rate (sps):</b>	Allows the user to view the Symbol Rate.
<b>INNER FEC</b>	<b>Viterbi</b> {1/2, 3/4, 7/8, None} <b>Optional FEC Rates:</b> <b>Sequential</b> {1/2, 3/4, 7/8} <b>Trellis 8PSK</b> {2/3} <b>Turbo ≤ 5 Mbps</b> {.793, .495} <b>Turbo ≤ 20Mbps</b> {1/2, 3/4, 7/8} <b>Comstream Seq</b> {3/4} <b>DVB VIT</b> {1/2, 2/3, 3/4, 5/6, 7/8} <b>DVB Trellis</b> {2/3, 5/6, 8/9}  Allows the user to select the Rx Code Rate and Type.
<b>TPC Interleaver</b>	<b>{DISABLED, ENABLED}</b> Allows the user to disable or enable TPC Interleaver. Valid only for Radyne turbo codes TPC.495 and TPC.793.
<b>Differential Encoding</b>	<b>{ENABLED, DISABLE}</b> Allows the user to enable or disable the Differential Decoder. Having the decoder enabled ensures proper phase lock. May not be adjustable in some modes.
<b>Scrambler Selection</b>	<b>{NONE, V.35-IESS, V.35 CITT, V.35 EF, IBS w/Optional Framing and optional Reed-Solomon, Reed-Solomon Scrambler w/Optional Framing, CCITT, V.35FC, OM-73, V.35EF_RS, TPC, DVB, EDMAC}</b> Allows the user to select the descrambler type.
<b>Scrambler Control</b>	<b>{ON, OFF}</b> Allows the user to enable or disable the descrambler operation.
<b>Satellite Framing</b>	<b>{1/15 (IBS), 1/15 (Async), 96 Kbps (IDR), EDMAC, EFAUPC, SCC, None}</b> <i>Used with IDR, IBS, or Asynchronous Interface Only.</i> Allows the user to select the Framing Type.
<b>Terrestrial Framing</b>	<b>{NONE, 188, 204} DVB only</b> Allows the user to select the Receive Terrestrial Framing.
<b>Data Polarity</b>	<b>{INV. TERR &amp; BASE, INV. BASEBAND, INV.TERR DATA, NONE}</b> Allows the user to invert the Rx Data polarity.
<b>Symbol Pair:</b>	<b>Symbol Pair: {NONE, SWAPPED}</b> Allows the user to swap the I & Q Channels.

**(BPSK Mode Only)**

<b>ESC Overhead</b>	<b>{VOICE X2, DATA 64KBPS}</b> IDR ESC Channel used for Voice or 64 K data channel.
<b>SCC Control Ratio</b>	<b>{1/1, 1/2, 1/3, 1/4, 1/5, 1/6, 1/7}</b> <b>NOTE: Only available (visible) when SCC is selected for the Rx Satellite Framing</b> Allows the user to simulate the framing used by the Satellite Control Channel Option (Pass Thru Mode only). The SCC CTL RATIO is the ratio of overhead in-band data to synchronizing words.
<b>SCC Inband Rate</b>	<b>{300 to 115200}</b> <b>NOTE: Only available (visible) when SCC is selected for the Rx Satellite Framing</b> Allows the user to request the rate of in-band data for the overhead channel.
<b>Async Inband Rate:</b>	<b>{75, 150, 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200}</b> Allows the user to select the async inband rate.

**Reed-Solomon Menu**

Hello "admin" Introduction | Password Setup | IP Administration | Sign Out  
**RADYNE**  
 OM20 Outdoor Modem

**MOD**  
☒ TRANSMIT ON ☐ MAJOR ALARM  
☐ TEST MODE ☐ MINOR ALARM

**DEMOM**  
☒ SIGNAL LOCK ☐ MAJOR ALARM  
☐ TEST MODE ☐ MINOR ALARM

☐ EVENT ☒ POWER  
☐ FAULT ☐ REMOTE

[TRANSMIT](#) [RECEIVE](#) [INTERFACE](#) [MONITOR](#) [ALARMS](#) [SYSTEM](#) [TEST](#)

RECEIVE / REED-SOLOMON

Reed-Solomon Control:

Interleaver Depth:

**Reed-Solomon N&K**  
 N Value:  K Value:

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**Figure 6-16. Reed-Solomon Menu**

- ReedSolomon Control:** {ENABLED, DISABLED}  
Allows the user to Enable/Disable the Reed-Solomon Encoder.
- RS N Value:** {Refer to Table 3-1 for valid n/k values}  
Displays the currently used N value, Reed-Solomon Codes. In Closed Net Mode, the user may select custom R-S Codes if optional Reed Solomon Card is installed.
- RS K Value:** {Refer to Table 3-1 for valid n/k values}  
Displays the currently used K value, Reed-Solomon Codes. In Closed Net Mode, the user may select custom R-S Codes if optional Reed Solomon Card is installed.
- Rx Interleaver Depth:** {4, 8, 12}

### ODU-LNB Menu

OM20 Outdoor Modem

MOD: TRANSMIT ON, TEST MODE, MAJOR ALARM, MINOR ALARM

DEMOM: SIGNAL LOCK, TEST MODE, MAJOR ALARM, MINOR ALARM

EVENT, FAULT, POWER, REMOTE

TRANSMIT RECEIVE INTERFACE MONITOR ALARMS SYSTEM TEST

RECEIVE / ODU-BUC

LO Frequency (MHz): 10000.000000

Osc Side Band: LOW SIDE BAND

Low Alarm Thrsh (Volts): 10.0

High Alarm Thrsh (Volts): 30.0

10 MHz LNB Reference: ENABLED

LNB Voltage: DISABLED

Low Alarm Thrsh (Amps): 0.00

High Alarm Thrsh (Amps): 2.50

Voltage Select: 18 VDC

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**Figure 6-17. ODU-LNB Menu**

- LO Frequency (MHz):** Allows the user to enter the Local Oscillator frequency in MHz in order for the downlink frequency to be displayed correctly (refer to the LNB manufacturer's specifications).
- Osc Side Band:** {LOW SIDE BAND, HIGH SIDE BAND}

	Allows the user to select the location of the LNB LO. The user must enter the location of the LNB LO in order for the UPLINK FREQUENCY to be displayed correctly. The LNB LO can be either higher or lower in frequency than the LNB output frequency. If the LNB LO is higher in frequency then the user must enter HIGH SIDEBAND.
<b>10 MHz LNB Reference:</b>	<b>{ENABLED, DISABLED}</b> Allows the user to enable or disable the 10 MHz BUC reference clock.
<b>LNB Voltage</b>	<b>{ENABLED, DISABLED}</b> Allows the user to enable/disable LNB supply voltage.
<b>Low Alarm Thrsh (Volts)</b>	This menu allows the user to establish the lower voltage threshold limit of the LNB. If voltage falls below this limit, an alarm will flash.
<b>High Alarm Thrsh (Volts)</b>	This menu allows the user to establish the upper voltage threshold limit of the LNB. If voltage exceeds this limit, an alarm will flash.
<b>Low Alarm Thrsh (Amps)</b>	This menu allows the user to establish the lower current/amp threshold limit of the LNB. If current falls below this limit, an alarm will flash.
<b>High Alarm Thrsh (Amps)</b>	This menu allows the user to establish the upper current threshold limit of the LNB. If current exceeds this limit, an alarm will flash.
<b>Voltage Select</b>	<b>{13 VDC, 15 VDC, 18 VDC, 20 VDC}</b>

### 6.3.4.3 Interface Menu

#### TX Setup Menu

OM20 Outdoor Modem

TRANSMIT RECEIVE **INTERFACE** MONITOR ALARMS SYSTEM TEST

INTERFACE / TX SETUP

Circuit Id:

Terr. Clock Source:

Sct Clock Source:

Esc Ch. 1 Gain:

Eth Flow Control:

Eth QOS Type:

Terrestrial Interface:

Tx Clock Polarity:

Sct Clock Polarity:

Esc Ch. 2 Gain:

Eth Daisy Chain:

Eth QOS Queue:

ASYNC

Async Mode:

ES Baud Rate:

ES Interface:

ES Bits/Char:

Drop Map

Drop Mode:

Sat Channel: 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

Terr TSlot: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

**Figure 4-18. TX Setup Menu**

**Circuit ID :** Allows the user entry of a Tx Circuit Identifier. Circuits can be given up to an 11 Character alphanumeric identity such as LINK1.

**Terrestrial Interface:** {RS422 SERIAL, G.703 E2, G.703 T2 BAL, G.703 T2 UNBAL, G.703 E1 BAL, G.703 E1 UNBAL, G.703 T1 AMI, G.703 T1 B8ZS, V.35, ASI, ETHERNET}  
Allows the user to select the Transmit Type.

**Terr. Clock Source:** {SCTE, SCT}  
Allows the user to select the Transmit Clock Source.

**Tx Clock Polarity:** {AUTO, NORMAL, INVERTED}  
Allows the user to select the Clock Polarity for the Tx Terrestrial Clock relative to the Tx Data. "Auto" detects wrong polarity and automatically corrects. If G.703 Interface is selected, this selection cannot be changed.

<b>SCT Clock Source:</b>	<b>{SCT, SCR}</b> Allows the user to select SCT Source. SCT is the internally generated SCT clock. SCR is the Rx Satellite clock. SCR is used for loop timing.
<b>SCT Clock Polarity:</b>	<b>{AUTO, NORMAL, INVERTED}</b> Allows the user to select the Clock Polarity for the SCT Clock relative to the Tx Data. "Auto" detects wrong polarity and automatically corrects. If G.703 Interface is selected, this selection cannot be changed.
<b>Esc Ch. 1 Gain</b>	Provides gain in channel 1 of engineering service channel in 96K framing mode.
<b>Esc Ch. 2 Gain</b>	Provides gain in channel 2 of engineering service channel in 96K framing mode.
<b>Eth Flow Control:</b>	<b>{Disabled, Enabled}</b> Allows the user to disable or enable flow control. <i>Only visible when Ethernet is selected as the interface type.</i>
<b>Eth Daisy Chain:</b>	<b>{Disabled, Port 4}</b> Allows the user to disable the Ethernet Port Daisy Chaining or enable it on Port 4. <i>Only visible when Ethernet is selected as the interface type.</i>
<b>ETH QOS Type</b>	<b>{NORMAL, PORT BASED}</b> Selects the standard DMD20 priority hierarchy of processing an IEEE 803.3ac Tag, Ipv4 Type of Service Field / Differentiated Services Field, or Ipv6 Traffic Class Field. The Port Based priority overrides any standard priority. When operating in this mode, Port 1 (JS1) has the highest priority and Port 4 (JS4) has the lowest.
<b>ETH QOS Queue</b>	<b>{FAIR WEIGHTED, STRICT PRIORITY}</b> Selects the standard DMD20 queue weighting of 8,4,2,1 that insures even the lowest priority traffic gets some bandwidth. Strict Priority insures that the higher priority traffic will always be transmitted before any lower priority traffic. With this setting, the lower priority traffic can starve.
<b>TX ASYNC</b>	
<b>Async Mode:</b>	<b>{ES-ES, ESC ENHANCED}</b> ES-ES is the normal IBS Async Channel. ESC Enhanced can be selected in Closed Net and uses the Overhead Signaling bytes in the IBS Overhead to pass asynchronous data. This menu is not available when SCC is selected.
<b>ES Interface:</b>	<b>{RS-232, RS-485}</b> Allows the user to select the interface type.



**ES Baud Rate:** {150 – 1024} For IBS ES to ES  
 {150 – 19200} For ES to ES Enhanced  
 {150 – 115200} For SCC Communications

**ES to ES : Fixed Baud Rate based on IBS Network Specification.** Available rates are listed in Table 3-3.

SCC: Allows user to select the interface Baud rate. Interface Rate must be equal to or greater than the In-Band Rate.

**ES Bits/Char:** {7,8}  
 Allows the user to choose between 7 or 8 bit data.

## DROP MAP

The Drop Map displays the current programmed Tx drop map for the modem. (Refer to Section 3.13, “Drop and Insert Mapping” in this manual).

**Drop Mode:** {NONE, T1-D4, T1-ESF, PCM-30, PCM-30C, PCM-31, PCM-31C, T1-D4-S, T1-ESF-S.}  
 Drop mode may only be changed from none when the drop and insert specified is in use.

**Terrestrial Time Slot:** {1-31}  
 Allows the user to edit the Tx Edit map to specify the terrestrial slots that will be dropped into the assigned satellite channels. The satellite channels are fixed and the number of channels is determined by the data rate. The terrestrial time slots available are determined by the drop mode.

**Reset Map:** Allows the user to reset the Tx D&I Map Time Slots.

**Submit Map:** Allows the user to Submit the Tx D&I Map Time Slots.

## RX Setup Menu

Hello "admin" Introduction | Password Setup | IP Administration | Sign Out

**RADYNE**  
OM20 Outdoor Modem

MOD: TRANSMIT ON, TEST MODE, MAJOR ALARM, MINOR ALARM  
DEMOM: SIGNAL LOCK, TEST MODE, MAJOR ALARM, MINOR ALARM  
EVENT, FAULT, POWER, REMOTE

TRANSMIT RECEIVE **INTERFACE** MONITOR ALARMS SYSTEM TEST

INTERFACE / RX SETUP

Circuit Id:   
 Terrestrial Streaming: BYTE OUTPUT  
 Esc Ch. 1 Gain: 5.0  
 Terrestrial Interface: RS422 SERIAL  
 Esc Ch. 2 Gain: 5.0

**BUFFER CLOCK CONTROL**  
 Buffer Size (msec): 32  
 Buffer Clock Polarity: NORMAL  
 Number of Buffer Sources: 1  
 Active Buffer Clock: RX SAT

**BUFFER CLOCK SOURCES**  
 Source 1 of 1: RX SAT  
 Source 2: EXT BNC  
 Source 3: SCTE  
 Source 4: EXT IDI  
 Source 5: SCT

**ASync**  
 Async Mode: ES-ES  
 ES Baud Rate: 2400  
 ES Interface: RS-485  
 ES Bits/Char: 8

**Insert Map**  
 Insert Mode: NONE Submit Map Reset Map T1/E1 FrameSrc: INTERNAL

Sat Channel: 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

**Figure 6-19. RX Setup Menu**

<b>Circuit ID:</b>	Provides entry of Rx Circuit Identifier. Circuits can be given up to an 11 Character alphanumeric Identity such as DLINK1
<b>Terrestrial Streaming:</b>	{BYTE OUTPUT, PACKET OUTPUT} ASI only Byte output = continuous Packet output = burst
<b>Terrestrial Interface:</b>	{RS422 SERIAL, G.703 T2 UNBAL, G.703 E1 BAL, G.703 E1 UNBAL, G.703 T1 AMI, G.703 T1 B8ZS, V.35, ETHERNET} Allows the user to select the Receive Type.
<b>Esc Ch. 1 Gain</b>	Provides gain in channel 1 of engineering service channel in 96K framing mode.
<b>Esc Ch. 2 Gain</b>	Provides gain in channel 2 of engineering service channel in 96K framing mode.

**BUFFER CLOCK CONTROL**

<b>Buffer Size (msec):</b>	<b>{0 - 64 msec}</b> Allows the user to set the Doppler Buffer Size in msec.
<b>Buffer Clock Polarity:</b>	<b>{NORMAL, INVERTED}</b> Allows the user to select the Buffer Clock Polarity for the Tx Terrestrial Clock relative to the Tx Data. If G.703 Interface is selected, this selection cannot be changed.
<b>Number of Buffer Sources:</b>	<b>{1 – 5}</b> Allows the user to select up to 5 clock sources.
<b>Active Buffer Clock:</b>	<b>{RXSAT, EXTBNC, SCTE, SCT, EXT IDI}</b> Shows the current active buffer clock source.

**BUFFER CLOCK SOURCES**

<b>Source 1 of 1:</b>	<b>{SCTE, SCE, RX SAT, EXT BNC, EXT IDI}</b>
<b>Source 2:</b>	<b>{SCTE, SCE, RX SAT, EXT BNC, EXT IDI}</b>
<b>Source 3:</b>	<b>{SCTE, SCE, RX SAT, EXT BNC, EXT IDI}</b>
<b>Source 4:</b>	<b>{SCTE, SCE, RX SAT, EXT BNC, EXT IDI}</b>
<b>Source 5:</b>	<b>{SCTE, SCE, RX SAT, EXT BNC, EXT IDI}</b>

**RX ASYNC**

<b>Async Mode:</b>	<b>{ES-ES, ESC ENHANCED}</b> ES-ES is displayed when IBS Network Spec is selected. ESC Enhanced can be selected in Closed Net and uses the Overhead Signaling bytes in the IBS Overhead to pass asynchronous data. This menu is not available when SCC is selected.
<b>ES Interface:</b>	<b>{RS-232, RS-485}</b> Allows the user to select the interface type.
<b>ES Baud Rate:</b>	<b>{150 – 1024} For IBS ES to ES</b> <b>{150 – 19200} For ES to ES Enhanced</b> <b>{150 – 115200} For SCC Communications</b>  <b>ES to ES : Fixed Baud Rate based on IBS Network Specification.</b> Available rates are listed in Table 3-3.

ES to ES Enhanced: Allows user to select the Interface Baud Rate. This selection will allow the user to set rate as listed in Table 3-3.

SCC: Allows user to select the interface Baud rate. Interface Rate must be equal to or greater than the In-Band Rate.

**ES Bits/Char:**

**{7,8}**

Allows the user to choose between 7 or 8 bit data.

**INSERT MAP**

The Insert Map displays the current programmed Rx Insert map for the modem. (Refer to Section 3.13, “Drop and Insert Mapping” in this manual).

**Insert Mode:**

**{NONE, T1-D4, T1-ESF, PCM-30, PCM-30C, PCM-31, PCM-31C, T1-D4-S, T1-ESF-S.}**

Insert mode may only be changed from none when the drop and insert specified is in use.

**Submit Map:**

Allows the user to Submit the Rx D&I Map Time Slots.

**Reset Map:**

Allows the user to reset the Rx D&I Map Time Slots.

**T1/E1 Frame Src:**

**T1/E1 FRAME SRC {INTERNAL, EXTERNAL}**

Selects the frame source for T1 or E1 framing.

**Terrestrial Time Slot:**

**{1-31}**

Allows the user to edit the Rx Edit map to specify the terrestrial slots that will be inserted into the assigned satellite channels. The satellite channels are fixed and the number of channels are determined by the data rate. The terrestrial time slots available are determined by the drop mode.

## General Menu

Hello "admin" Introduction | Password Setup | IP Administration | Sign Out

**MOD**  
 TRANSMIT ON MAJOR ALARM  
 TEST MODE MINOR ALARM

**DEMOD**  
 SIGNAL LOCK MAJOR ALARM  
 TEST MODE MINOR ALARM

EVENT POWER  
 FAULT REMOTE

**OM20 Outdoor Modem**

TRANSMIT RECEIVE **INTERFACE** MONITOR ALARMS SYSTEM TEST

INTERFACE / GENERAL

External Frequency (MHz): 10.000000  
 Reference Frequency (MHz): 10.000000

Reference Frequency Source: HIGH STABILITY  
 BB Minor Alarm Relay Usage: IBS ALMs

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**Figure 6-20. General Menu**

**External Frequency (MHz):** {Variable Through Data Rate}  
 Allows the user to select the external clock frequency in MHz.

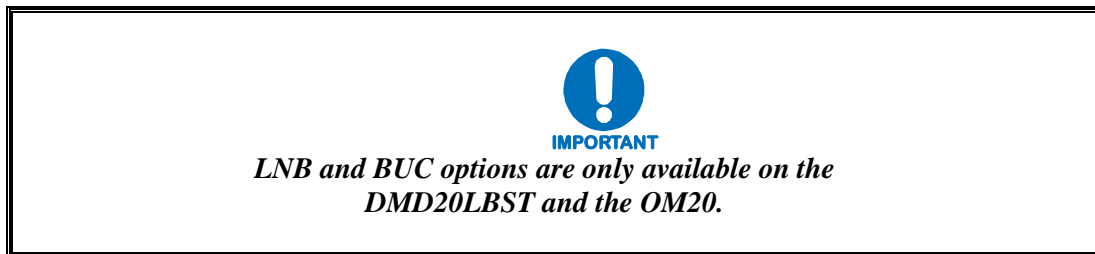
**Reference Frequency Source:** {INTERNAL, EXTERNAL, HIGH-STABILITY}

Reference Frequency (MHz): {EXTERNAL, HIGH-STABILITY}

## 6.3.4.4 Monitor Menu

### General | Voltages Menu

Figure 4-21. General | Voltages Menu



- Rx Offset Frequency (Hz):** Displays the received carrier frequency offset as measured by the modem.
- Rx Input Level (dBm):** Displays the estimated receive signal level as seen by the Demodulator. This window is active continuously and is above the Gel Tab area.
- Eb/No (dB):** Displays the estimated  $E_b/N_o$  as seen by the demodulator. This window is active continuously and is above the Gel Tab area.
- Raw BER:** Displays the estimated channel error rate (before decoding) measured by the modem. This window is active continuously and is above the Gel Tab area.

<b>Corrected BER:</b>	The CBER display shows an estimated corrected bit error rate of the modem. Depending on the symbol rate the modem is running, the high-end performance scale of this display will vary ( $10 E^{-9}$ , $10^{-10}$ or $10^{-11}$ ). At some symbol rates, a better than scale reading will appear as $0.0 \times 10^{-00}$ . At other symbol rates, it will appear as $E^{**}$ . In either case, they both mean performance is better than the scale upper limit. This window continuously is active and is above the Gel Tab area.
<b>Rx Buffer Level (Fill %):</b>	<b>{0 – 100%}</b> Displays the status of the Doppler Buffer. This window is above the Gel Tab area.
<b>Rx Bit Errors:</b>	<b>?</b>
<b>+1.5V TX Supply</b>	Displays the measured voltage of the 1.5 Volt Tx power bus located inside the modem.
<b>+1.5V RX Supply</b>	Displays the measured voltage of the 1.5 Volt Rx power bus located inside the modem.
<b>+3.3V Supply</b>	Displays the measured voltage of the +3.3 Volt power bus located inside the modem.
<b>+5V Supply</b>	Displays the measured voltage of the +5 Volt power bus located inside the modem.
<b>+12V Supply</b>	Displays the measured voltage of the +12 Volt power bus located inside the modem.
<b>-12V Supply</b>	Displays the measured voltage of the -12 Volt power bus located inside the modem.
<b>+20V Supply</b>	Displays the measured voltage of the +20 Volt power bus located inside the modem.
<b>LNB Current (Amps):</b>	Displays the measured current of the LNB
<b>LNB Voltage (Volts):</b>	Displays the measured voltage of the LNB
<b>BUC Current (Amps):</b>	Displays the measured current of the BUC
<b>BUC Voltage (Volts):</b>	Displays the measured voltage of the BUCB

## Monitor Eth Link Status Menu

The screenshot shows the OM20 Outdoor Modem web interface. At the top, it says "Hello 'admin'" and "OM20 Outdoor Modem". There are navigation links: "Introduction", "Password Setup", "IP Administration", and "Sign Out". Below this is a status bar with various indicators: "MOD" (TRANSMIT ON, TEST MODE, MAJOR ALARM, MINOR ALARM), "DEMOM" (SIGNAL LOCK, TEST MODE, MAJOR ALARM, MINOR ALARM), "EVENT" (FAULT, REMOTE), and "POWER". A menu bar contains buttons for "TRANSMIT", "RECEIVE", "INTERFACE", "MONITOR" (highlighted), "ALARMS", "SYSTEM", and "TEST". The main content area is titled "MONITOR / ETH LINK STATUS". It displays the following information:

Total Packets:	0	Port 1 Status:	DOWN
Error Packets:	0	Port 2 Status:	DOWN
Packet Error Rate:	0.00E-00	Port 3 Status:	DOWN
<a href="#">RESET ETHERNET PACKET STATS</a>		Port 4 Status:	DOWN
		WAN Status:	DOWN

At the bottom, there are links for "Technical Specifications", "Product Options", "Troubleshooting", "About Us", "Contact Us", and "©2006 Radyne Corporation".

**Figure 6-22. ETH Link Status Menu**

- Total Packets:** Displays the total number of Ethernet packets received from the satellite (*Only visible when Ethernet is selected as the interface type*).
- Error Packets:** Displays the number of erred Ethernet packets received from the satellite (*Only visible when Ethernet is selected as the interface type*).
- PKT Error Rate:** Displays the satellite Packet Error Rate (*Only visible when Ethernet is selected as the interface type*).
- Reset Ethernet Packet Stats:** Allows the user to reset the Ethernet packet statistics by pressing this button (*Only visible when Ethernet is selected as the interface type*).



**IMPORTANT**

*The status of the following ports may be one of the following:*

<i>Down:</i>	<i>The link is down.</i>
<i>Unresolved:</i>	<i>Unable to agree on connection speed.</i>
<i>10 Mbps Half:</i>	<i>Connected at 10 Base-T Half Duplex.</i>
<i>10 Mbps Full:</i>	<i>Connected at 10 Base-T Full Duplex.</i>
<i>100 Mbps Half:</i>	<i>Connected at 100 Base-T Half Duplex.</i>
<i>100 Mbps Full:</i>	<i>Connected at 100 Base-T Full Duplex.</i>

**PORT 1 STATUS****{See the note above}**

Displays the current status of LAN Port 1.

**PORT 2 STATUS****{See the note above}**

Displays the current status of LAN Port 2.

**PORT 3 STATUS****{See the note above}**

Displays the current status of LAN Port 3.

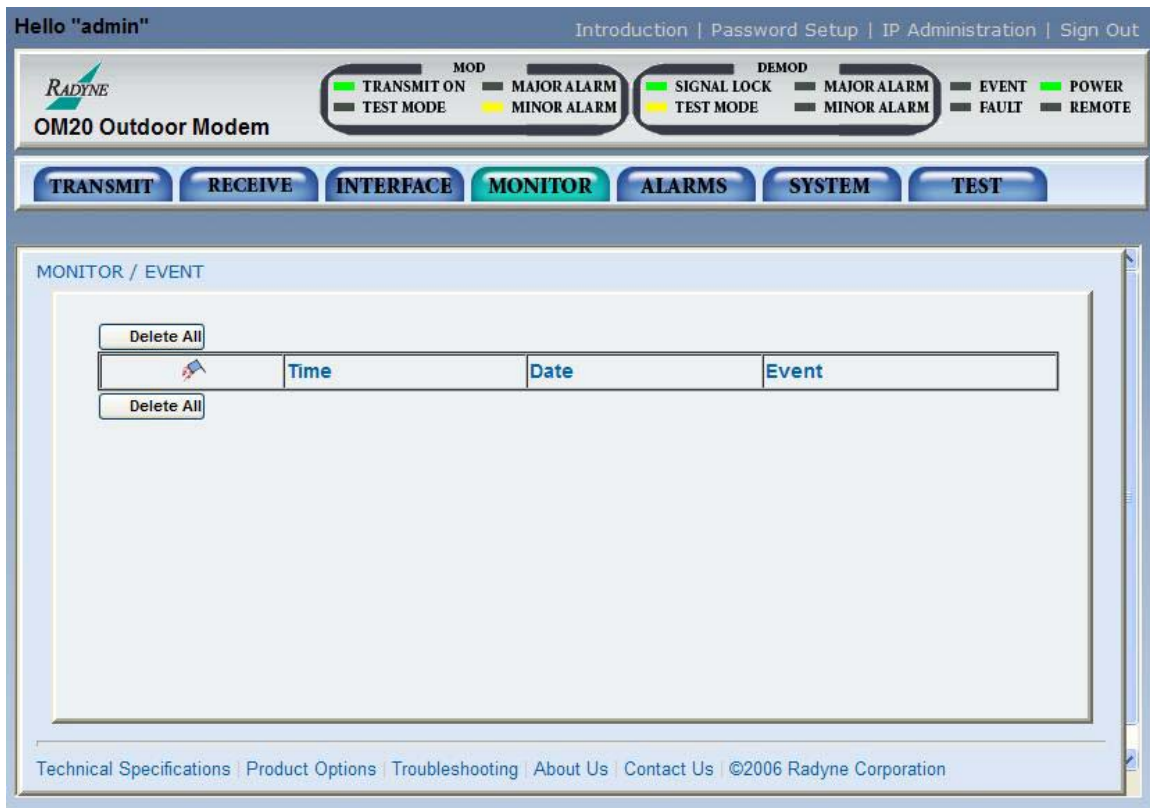
**PORT 4 STATUS****{See the note above}**

Displays the current status of LAN Port 4.

**WAN STATUS****{See the note above}**


Displays the current status of the WAN Port.

## Event Menu



**Figure 6-23. Event Menu**

**Delete All:** Cleans the entire event buffer.

<b>Event Type:</b>	
<b>I</b>	<b>Informational</b>
<b>Y</b>	<b>Yellow alarm. Indicates a transmit or receive warning condition.</b>
<b>R</b>	<b>Red alarm. Indicates a transmit or receive failure, losing traffic.</b>



**IMPORTANT**

*The Event Buffer may be sorted by warning level, time, date, or event description. This feature may be used to further investigate event occurrences.*

## 6.3.4.5 Alarms Menu

### Transmit Menu

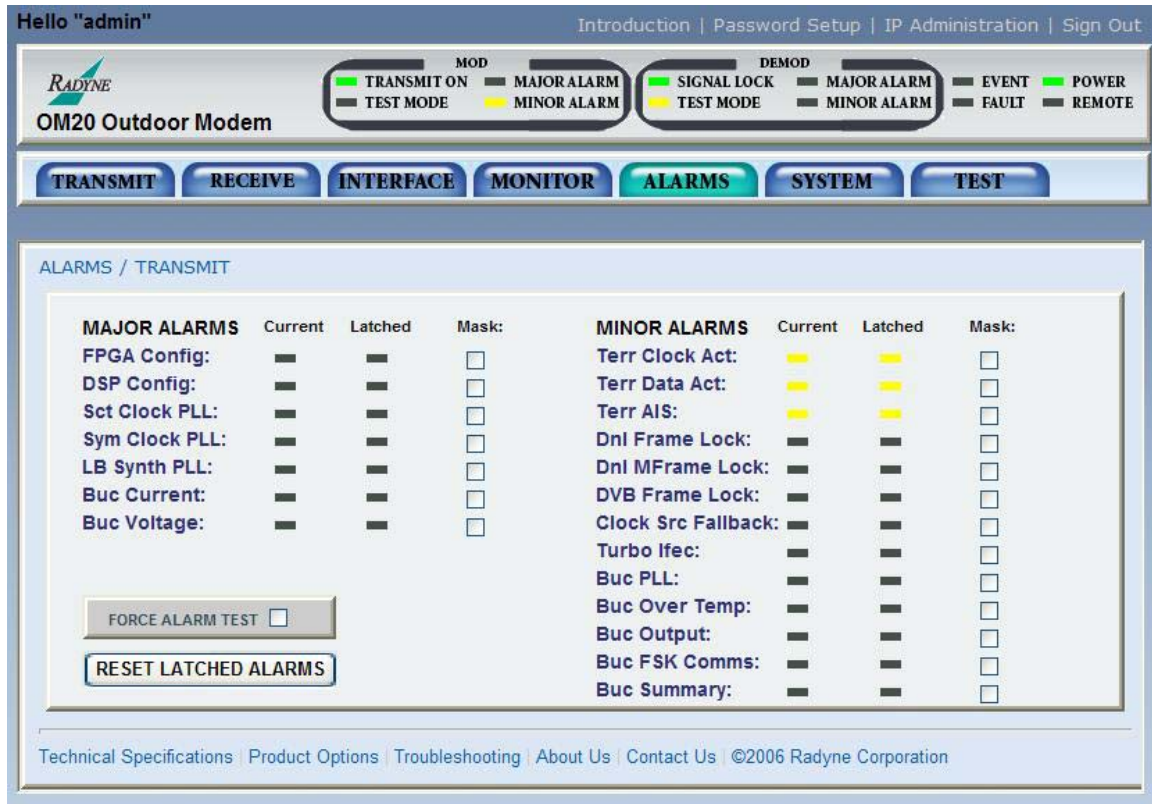


Figure 6-24. Transmit Menu

### MAJOR ALARMS

**FPGA Config:** {Pass/Fail, Unmasked/Masked}  
Indicates a transmit FPGA configuration failure.

**DSP Config:** {Pass/Fail, Unmasked/Masked}  
Indicates a transmit DSP configuration failure.

**Sct Clock PLL:** {Pass/Fail, Unmasked/Masked}  
Indicates that the Tx SCT Clock PLL is not locked. This alarm will flash on during certain modem parameter changes. A solid indication points toward a configuration failure within the modem.

**Sym Clock PLL:** {Pass/Fail, Unmasked/Masked}  
Indicates that the Tx Symbol Clock PLL is not locked. This alarm will flash on during certain modem parameter changes. A

solid indication points toward a problem with the incoming clock to the modem (SCTE).

**LB Synth PLL:****{Pass/Fail, Unmasked/Masked}**

Indicates that the Tx L-Band Synthesizer is not locked. This alarm will flash on during certain modem parameter changes. A solid indication points toward a configuration problem within the modem.

**BUC Current:****{Pass/Fail, Unmasked/Masked}**

Indicates that current is either below or above the threshold limits of the BUC, as specified by the OM20. Only active when BUC Voltage is enabled

**BUC Voltage:****{Pass/Fail, Unmasked/Masked}**

Indicates that the voltage is not functioning correctly when the BUC Voltage is enabled.

**Ethernet WAN****{Pass/Fail, Unmasked/Masked}**

Indicates that the interface card is faulted and will not pass data (*displays only when the Ethernet Card is installed and the Ethernet Interface is selected*).

**MINOR ALARMS****Terr Clock Act:****{Pass/Fail, Unmasked/Masked}**

Indicates no Terrestrial Clock activity.

**Terr Data Act:****{Pass/Fail, Unmasked/Masked}**

Indicates no Tx Data activity.

**Terr AIS:****{Pass/Fail, Unmasked/Masked}**

Indicates that AIS has been detected in the Tx Data Stream.

**DnI Frame Lock:****{Pass/Fail, Unmasked/Masked}**

Indicates that the TX Oversample Clock PLL is not locked. This alarm will flash on during certain modem parameter changes. A solid indication points toward a configuration problem within the modem.

**DnI MFrame Lock:****{Pass/Fail, Unmasked/Masked}**

Indicates that Tx Composite Clock PLL is not locked. This alarm will flash on during certain modem parameter changes. A solid indication points toward a problem with the incoming clock to the modem (SCTE).

**DVB Frame Lock:****{Pass/Fail, Unmasked/Masked}**

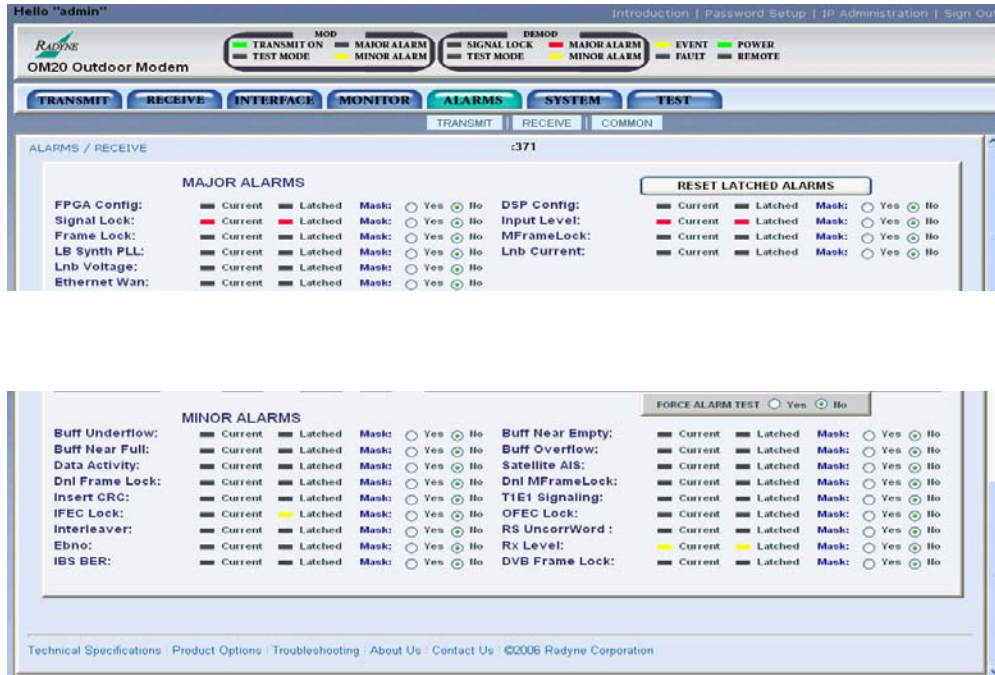
Indicates that Tx input data stream framing does not match the user selected TX TERR FRAMING.

**RESET LATCHED ALARMS:**

Clicking on this button will reset (Clear) all Latched Alarms

**FORCE ALARM TEST:**

Clicking on this button will force alarms

**Receive Menu****Figure 6-25. Receive Menu****MAJOR ALARMS**

<b>FPGA Config:</b>	{Pass/Fail, Unmasked/Masked}
Indicates a receive FPGA hardware failure.	
<b>DSP Config:</b>	{Pass/Fail, Unmasked/Masked}
Indicates a receive DSP failure.	
<b>Signal Lock:</b>	{Pass/Fail, Unmasked/Masked}
Indicates that the demod is unable to lock to a signal.	
<b>Input Level;</b>	{Pass/Fail, Unmasked/Masked}
Indicates Rx signal level has fallen below input threshold.	
<b>Frame Lock:</b>	{Pass/Fail, Unmasked/Masked}
Indicates that the Framing Unit is unable to find the expected framing pattern.	
<b>MFrameLock:</b>	{Pass/Fail, Unmasked/Masked}

This alarm will flash on during certain modem parameter changes. A solid indication points toward a problem with the incoming clock to the modem (SCTE).

**LB Synth PLL:****{Pass/Fail, Unmasked/Masked}**

Indicates that the Rx L-Band Synthesizer is not locked. This alarm will flash on during certain modem parameter changes. A solid indication points toward a configuration problem within the modem.

**LNB Current:****{Pass/Fail, Unmasked/Masked}**

Indicates that current is either below or above the threshold limits of the LNB, as specified by the OM20. Only active when LNB Voltage is enabled.

**LNB Voltage:****{Pass/Fail, Unmasked/Masked}**

Indicates that voltage is not functioning correctly when voltage is enabled.

**Ethernet WAN:****{Pass/Fail, Unmasked/Masked}**

Indicates that the interface card is faulted and will not pass data (*displays only when the Ethernet Card is installed and the Ethernet Interface is selected*).

**MINOR ALARMS****Buffer Underflow:****{Pass/Fail, Unmasked/Masked}**

Indicates that a Doppler Buffer underflow has occurred.

**Buff Near Empty:****{Pass/Fail, Unmasked/Masked}**

Indicates that the Doppler Buffer is about to underflow.

**Buff Near Full:****{Pass/Fail, Unmasked/Masked}**

Indicates that the Doppler Buffer is about to overflow.

**Buffer Overflow:****{Pass/Fail, Unmasked/Masked}**

Indicates that a Doppler Buffer overflow has occurred.

**Rx Data Activity:****{Pass/Fail, Unmasked/Masked}**

Indicates that there is no Rx Data activity.

**Satellite AIS:****{Pass/Fail, Unmasked/Masked}**

Indicates that AIS has been detected in the receive satellite data stream.

**DnI Frame Lock:****{Pass/Fail, Unmasked/Masked}**

Indicates if drop/insert data is frame locked.

**DnI MFrame Lock:****{Pass/Fail, Unmasked/Masked}**

Indicates if drop/insert data has multiframe lock.

**Insert CRC:****{Pass/Fail, Unmasked/Masked}**

	Indicates if the Circular Redundancy Check is passing in PCM-30C and PCM-31C Modes.
<b>T1/E1 Signaling:</b>	<b>{Pass/Fail, Unmasked/Masked}</b> Indicates that the Framing Unit is unable to find the expected framing pattern.
<b>IFEC Lock:</b>	<b>{Pass/Fail, Unmasked/Masked}</b> Indicates that the Framing Unit is unable to find the expected framing pattern.
<b>OFEC Lock</b>	<b>: {Pass/Fail, Unmasked/Masked}</b> Indicates that the Reed-Solomon Decoder is not locked.
<b>Interleaver:</b>	<b>{Pass/Fail, Unmasked/Masked}</b> Indicates that the Reed Solomon Interleaver is not synchronized.
<b>RS Uncorr. Word:</b>	<b>{Pass/Fail, Unmasked/Masked}</b> Indicates status of the Reed Solomon uncoded word fault.
<b>Ebno:</b>	<b>{Pass/Fail, Unmasked/Masked}</b> Indicates that the Eb/No is outside of limits.
<b>Rx Level:</b>	<b>{Pass/Fail, Unmasked/Masked}</b> Indicates if Rx level is below allowable limits.
<b>IBS BER:</b>	<b>{Pass/Fail, Unmasked/Masked}</b> Indicates that there are more than one in 1000 bits in error in IBS Mode.
<b>DVB Frame Lock:</b>	<b>{Pass/Fail, Unmasked/Masked}</b> Indicates that the Rx Satellite Data Stream Framing is not DVB.
<b>RESET LATCHED ALARMS</b>	Clicking on this button will reset (Clear) all Latched Alarms
<b>FORCE ALARM TEST</b>	Clicking on this button will force alarms.

## Common Menu

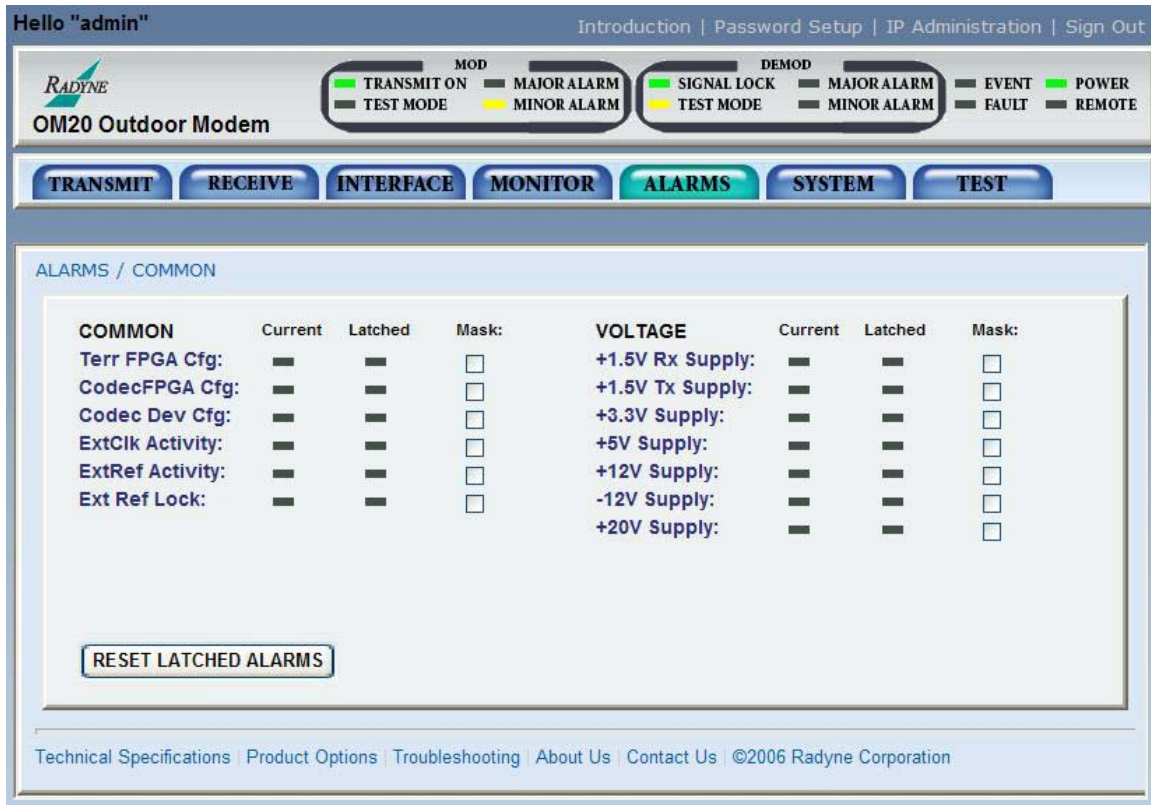


Figure 6-26. Common Menu

### COMMON ALARMS

<b>Terr FPGA Cfg:</b>	<b>{Pass/Fail, Unmasked/Masked}</b> Indicates an Interface Card FPGA configuration failure.
<b>Codec FPGA Cfg:</b>	<b>{Pass/Fail, Unmasked/Masked}</b> Indicates Turbo Codec Card FPGA configuration failure.
<b>Codec Dev Cfg:</b>	<b>{Pass/Fail, Unmasked/Masked}</b> Indicates Turbo Codec Card ASIC configuration failure.
<b>ExtClk Activity:</b>	<b>{Pass/Fail, Unmasked/Masked}</b> Indicates External Clock Activity failure.
<b>ExtRef Activity:</b>	<b>{Pass/Fail, Unmasked/Masked}</b> Indicates External Reference Activity failure.
<b>ExtRef Lock:</b>	<b>{Pass/Fail, Unmasked/Masked}</b>



**VOLTAGE ALARMS****+1.5V RX Supply****{Pass/Fail, Unmasked/Masked}**

Displays the measured voltage of the 1.5 Volt Rx power bus located inside the modem.

**-1.5V TX Supply****{Pass/Fail, Unmasked/Masked}**

Displays the measured voltage of the 1.5 Volt Tx power bus located inside the modem.

**+3.3V Supply****{Pass/Fail, Unmasked/Masked}**

Displays the measured voltage of the +3.3 Volt power bus located inside the modem.

**+5V Supply****{Pass/Fail, Unmasked/Masked}**

Displays the measured voltage of the +5 Volt power bus located inside the modem.

**+12V Supply****{Pass/Fail, Unmasked/Masked}**

Displays the measured voltage of the +12 Volt power bus located inside the modem.

**-12V Supply****{Pass/Fail, Unmasked/Masked}**

Displays the measured voltage of the -20 Volt power bus located inside the modem.

**+20V Supply****{Pass/Fail, Unmasked/Masked}**

Displays the measured voltage of the +20 Volt power bus located inside the modem.

**RESET LATCHED ALARMS**

Clicking on this button will reset (Clear) all Latched Alarms

### 6.3.4.6 System Menu

#### Terminal & Remote Menu

OM20 Outdoor Modem

MOD: TRANSMIT ON, TEST MODE, MAJOR ALARM, MINOR ALARM

DEMOM: SIGNAL LOCK, TEST MODE, MAJOR ALARM, MINOR ALARM

EVENT, FAULT, POWER, REMOTE

TRANSMIT, RECEIVE, INTERFACE, MONITOR, ALARMS, SYSTEM, TEST

SYSTEM / TERMINAL / REMOTE

Remote Port Control: TERMINAL

Terminal Emulation: VT100

Terminal Baud Rate: 19200

Multidrop Address: 32

Remote Interface: RS-485

Remote Baud Rate: 19200

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Figure 6-27. Terminal & Remote Menu

<b>Remote Port Control</b>	{TERMINAL, COMPUTER}
<b>Terminal Emulation:</b>	{VT-100, WYSE50, VT100} Allows the user to select the emulation type.
<b>Terminal Baud Rate:</b>	{150, 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200} Allows the user to enter the terminal baud rate.
<b>Multidrop Address:</b>	{32 - 255} Allows the user to enter the Remote Port Multidrop Address.
<b>Remote Interface:</b>	{RS-232, RS-485} Allows the user to enter the Remote Port interface type.
<b>Remote Baud Rate:</b>	{150, 300, 600, 1200, 2400, 4800, 9600, 19200, 38,400, 57,600, 115200} Allows the user to enter the Remote Port Baud Rate.

## HW/FW Configuration Menu

Hello "admin" Introduction | Password Setup | IP Administration | Sign Out

**MOD**

TRANSMIT ON MAJOR ALARM  
TEST MODE MINOR ALARM

**DEMOM**

SIGNAL LOCK MAJOR ALARM  
TEST MODE MINOR ALARM

EVENT POWER  
FAULT REMOTE

**TRANSMIT RECEIVE INTERFACE MONITOR ALARMS SYSTEM TEST**

SYSTEM / HW-FW CONFIG

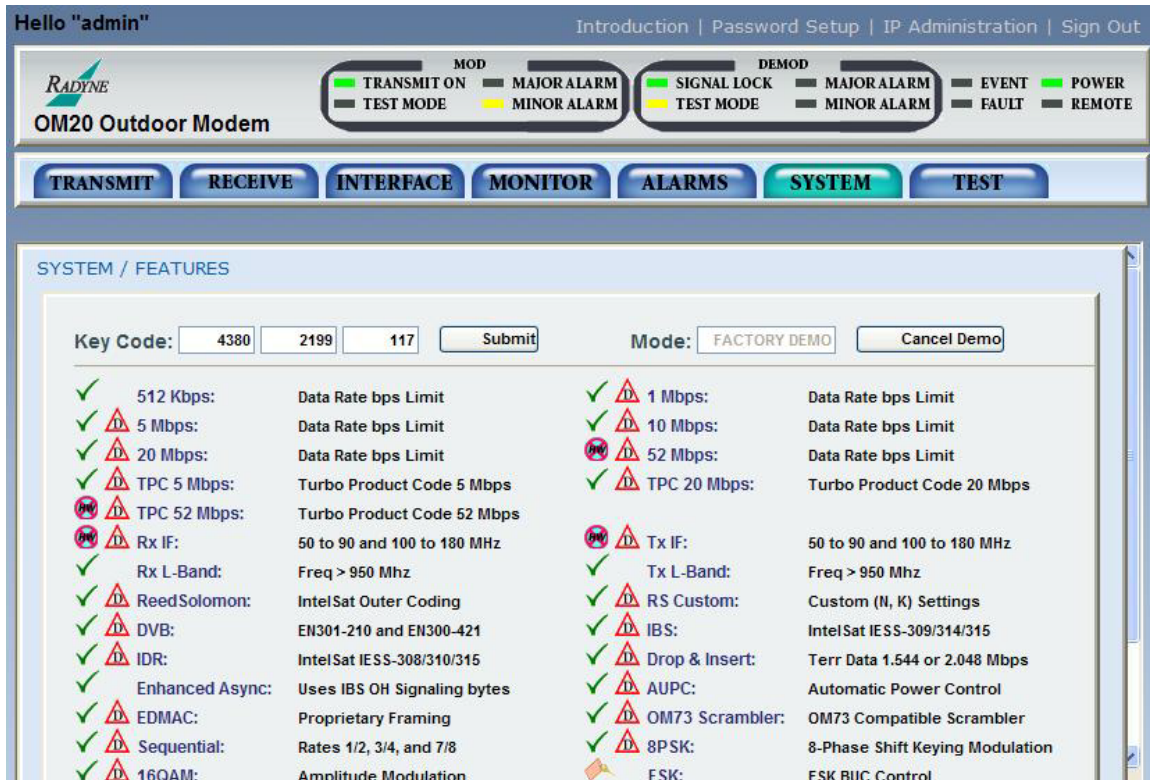
Firmware :		Main Board:	08=AS/5000-1,E
M & C Time Stamp:	03/24 11:35	IF Board:	16=ASR5470-1
Buc Id Info:	NONE/UNKNOWN	Terr Intf Board:	01=AS/4975-
Buc Serial Number:	NONE/UNKNOWN	Codec Board:	

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**Figure 6-28. HW/FW Configuration Menu**






<b>Firmware Revision:</b>	Displays the installed firmware revision.
<b>M&amp;C Revision:</b>	Displays the installed Monitor and Control revision.
<b>Main Board:</b>	Indicates the Radyne part number for the Baseband Board Assembly.
<b>IF Board:</b>	Indicates the Radyne part number for the IF Board Assembly.
<b>Terr Intf Board:</b>	Indicates the Radyne assembly number for the Terrestrial Interface Assembly.
<b>Codec Board:</b>	Indicates the Radyne part number for the Codec Board.

## Features Menu



**Figure 6-29. Features Menu**

The Web Browser menu allows viewing of actively enabled features. Each feature displays a series of symbols that describe feature status. The following symbols indicate:

	Installed
	No hardware available. Requires hardware for upgrade.
	Feature is in Demo Mode and will expire.
	Key Code Required
	Call customer service. Feature is enabled for customer use, but the OM20 hardware required has not been detected or has failed.

Features upgrades can also be implemented through the Web Browser interface.

### 6.3.4.7 Test Menu

#### Test Pattern | Carrier Menu

OM20 Outdoor Modem

TRANSMIT RECEIVE INTERFACE MONITOR ALARMS SYSTEM TEST

TEST PATTERN | CARRIER

Tx Test Pattern: NONE  
 Rx Test Pattern: NONE  
 Rx Pattern Sync: YES  
 Loopback Type: IF  
 Pattern Ber: 0.00E-00  
 Pattern Error Count: 0  
 Carrier Type: NORMAL

RESTART TEST PATTERN

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Figure 6-30. Test Pattern | Carrier Menu

<b>Tx Test Pattern:</b>	{NONE, 2047, 2 <sup>15</sup> -1, 2 <sup>23</sup> -1} Allows the user to enable the transmit test patterns listed above.
<b>Rx Test Pattern:</b>	{NONE, 2047, 2 <sup>15</sup> -1, 2 <sup>23</sup> -1} Allows the user to enable the receive test pattern listed above.
<b>Rx Pattern Sync:</b>	{YES, NO} Yes indicates that the received test pattern is in sync.
<b>Loopback Type:</b> <b>BASEBAND</b>	{NONE, TERR RX, BASEBAND RX, TERR TX, TX, IFEC TX, IF, BASEBAND RX/TX}
<b>Pattern Ber:</b>	{NO SYNC, nnnn x 10-n} Displays the measured Bit Error Rate for the received test pattern.

---

<b>Pattern Error Count:</b>	<b>{NO SYNC, nnnn x 10n}</b> Displays the number of errors detected by the test pattern checker.
<b>Carrier Type:</b>	<b>{NORMAL, CW, DUAL, OFFSET POS FIR, NEG FIR}</b>
<b>RESTART TEST PATTERN:</b>	Clicking this button resets the test pattern counter and generator.

---

## 6.4 Configuring the OM20 to use the Ethernet Data Interface (Optional)

The OM20 Ethernet related menus are available and can be used to control the data interface as follows:

Under the Interface Menu:

Under the Tx Setup Menu:

Set the Terrestrial Interface to Ethernet.

Set the Ethernet Flow Control as desired (refer to Section 6.3.1 for details).

Set the Tx Clock to SCTE.

Set the Tx Clock Polarity to Normal.

Under Drop & Insert:

Set the Drop Mode to None.

Under the Interface Menu:

Under the Rx Setup Menu:

Set the Terrestrial Interface to Ethernet.

Set the Buffer Size to Zero.

Set the Buffer Clock to Rx Sat.

Set the Buffer Clock Polarity to Normal.

Under Drop & Insert:

Set the Insert Mode to None.

### 6.4.1 Ethernet Flow Control

When disabled, if a packet is received for transmission and no packet buffer space is available, the incoming packet is discarded.

When enabled, flow control is used to throttle the transmission station in order to avoid overrunning the transmit buffers, which would in turn cause packets to be dropped. The throttling mechanism used depends upon the interface and whether it is half-duplex or full duplex and is described in the following sub-paragraphs:

#### 6.4.1.1 Half-Duplex Flow Control

In half-duplex mode, the OM20 uses industry standard backpressure to support flow control as follows:

When available buffer space is almost gone, the OM20 will force a collision on the input port when it senses an incoming packet. This collision will cause the transmitting station to back off and retry the transmission.

The OM20 will stop forcing collisions as soon as free buffer space becomes available.

### 6.4.1.2 Full-Duplex Flow Control

In full-duplex mode, the OM20 implements IEEE 8802.3x flow control as follows:

When available buffer space is almost gone, the OM20 sends out a pause frame with the maximum pause time to stop the remote nodes from transmitting.

The OM20 sends out another pause frame with the pause time set to zero as soon as free buffer space becomes available.

### 6.4.2 Packet Statistics

The following statistics are available under the Monitor Menu when the Ethernet Data Interface is selected:

**Total Packets:** This Counter displays the total number of Ethernet packets received from the satellite.

**Error Packets:** This counter displays the total number of Ethernet packets received from the satellite that had errors.

**Packet Error Rate:** This displays the Ethernet Packet Error Rate (PER) from the satellite.

**Packet Statistics Reset:** Allows the user to reset the Ethernet Total Packets and Ethernet Error Count by pressing <Enter>.

**Link Status:** The following status is available under the Monitor Menu/Link Status Sub-Menu when the Ethernet Data Interface is selected:

**Port 1 Status:** Displays the current status of LAN Port 1.

**Port 2 Status:** Displays the current status of LAN Port 2.

**Port 3 Status:** Displays the current status of LAN Port 3.

**WAN Status:** Displays the current status of the WAN Port.

For each of the above-listed ports, the status may take on one of the following values/meanings.

**Down:** The link is down.

**Unresolved:** Unable to agree on connection speed.

**10 Mbps Half:** Connected at 10 Base-T Half Duplex.

**10 Mbps Full:** Connected at 10 Base-T Full Duplex.

**100 Mbps Half:** Connected at 100 Base-T Half Duplex.

**100 Mbps Full:** Connected at 100 Base-T Full Duplex.

If all four LAN Ports are down, a Tx Data Activity Minor Alarm will be generated.

If the WAN Port is down, a Tx and Rx Ethernet WAN Major Alarm will be generated.

---

## 6.5 Terminal Mode Control

The OM20 Terminal Mode Control allows the use of an external terminal or computer to monitor and control the modem from a full screen interactive presentation operated by the modem itself. No external software is required other than VT-100 Terminal Emulation Software (e.g. “Procomm” for a computer when used as a terminal. The Control Port is normally used as an RS-232 Connection to the terminal device. The RS-232 operating parameters can be set using the modem Front Panel and stored in EEPROM for future use (refer to Section 6.4.1 for setup and terminal screens). Refer to Section 4 (Terminal Screen Menus) of the “*Remote Protocol For The DMD20/DMD50/DMD2050/OM20*” Manual (TM-117) for additional information on terminal screen menus.



*For RLLP command structure, the SNMP MIB and the Terminal Screens reference the “Remote Protocol Manual for the (TM-117).*

*This specification is applicable to the DMD20, DMD20LBST, DMD50, DMD2050, and OM20 Modems.*



## 6.5.1 Modem Terminal Mode Control

The modem can be interactively monitored and controlled in the Terminal Mode, with a full screen presentation of current settings and status. Programming is accomplished by selecting the item to be modified and pressing the terminal key of the option number. For example, to change the transmit data rate, enter '33' at the terminal. The modem will respond by presenting the options available and requesting input. Two types of input may be requested. If the input is multiple choice, the desired choice is selected by pressing the 'Space' key. When the desired option is displayed, press the 'Enter' key to select that option. The other possible input type requires a numerical input (such as entering a frequency or data rate. This type of input is followed by pressing the 'Enter' or carriage return key. An input can be aborted at any time by pressing the 'ESC' key. Invalid input keys cause an error message to be displayed on the terminal.

The Terminal Control Mode supports serial baud rates of 150, 300, 1200, 2400, 4800, 9600, 19200, and 38400. The connection must be set for 8 data bits, 1 stop bit and no parity (8,N,1). Three terminal emulations are supported: VT-100, WYSE 50, and ADDS-VP.

“\$” is used for setting the screen when the terminal is used for the first time the non-volatile memory is reset.

---

## 6.6 Modem Remote Communications

### 6.6.1 Host Computer Remote Communications

The Remote Port (J2) of the OM20 allows for complete control and monitoring of all OM20 parameters and functions via an RS-232 Serial Interface, or RS-485 for RLLP Protocol. 'Terminal Mode' can be entered from the GUI interface under the "System" menu by selecting "System" and then "Terminal" followed by "Terminal". The baud rate and evaluation type can be changed at the front panel by using the *System>Baud Rate* Menu.

Control and status messages are conveyed between the OM20 and the subsidiary modems and the host computer using packetized message blocks in accordance with a proprietary communications specification. This communication is handled by the Radyne Link Level Protocol (RLLP), which serves as a protocol 'wrapper' for the RM&C data. Complete information on monitor and control software is contained in the following sections.



*For RLLP command structure and the SNMP MIB, reference the "Remote Protocol for the DMD20/DMD50/DMD2050/OM20" manual (TM-117).*

**Notes:**

[illegible]

# Chapter 7. Maintenance and Troubleshooting

This section discusses unit maintenance and troubleshooting for the OM20 Universal Satellite Modem.



*The OM20 contains a Lithium Battery. **DANGER OF EXPLOSION** exists if the battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries in accordance with local and national regulations.*

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## 7.1 Periodic Maintenance

There is no external fuse on the OM20. The fuse is located on the power supply assembly inside the case, and replacement is not intended in the field.

### 7.1.1 Clock Adjustment

The OM20 allows for internal VCO speed adjustment from the GUI. Clock adjustment should be performed only when an internal clock source has insufficient accuracy for the custom modem application.

---

## 7.2 Troubleshooting

Should a unit be suspected of a defect in field operations after all interface signals are verified, the correct procedure is to replace the unit with another known working OM20. If this does not cure the problem, wiring or power should be suspect. The following is a brief list of possible problems that could be caused by failures of the modem or by improper setup and configuration for the type of service. The list is arranged by possible symptoms exhibited by the OM20 modem.

Symptom	Possible Cause
The Modem will not acquire the incoming carrier:	There is an improper receive input to modem.
	The Receive Carrier Level is too low.
	The Receive Carrier Frequency is outside of the acquisition range.
	The Transmit Carrier is incompatible.
	Modem is in Test Mode.
The Async Port is not configured correctly.	The switches may not be set in the correct positions.

## 7.2.1 Alarm Faults

### 7.2.1.1 Major Tx Alarms

Alarm	Possible Cause
FPGA CFG	Indicates a transmit FPGA hardware failure.
DSP CFG	Indicates a transmit FPGA failure.
SCT Clock PLL	Indicates that the Tx SCT Clock PLL is not locked. This alarm will flash on during certain modem parameter changes. A solid indication points toward a configuration problem within the modem.
SYM Clock PLL	Indicates that the Tx Symbol Clock PLL is not locked. This alarm will flash on during certain modem parameter changes. A solid indication points toward a problem with the incoming clock to the modem (SCTE).
LB Synth PLL	Indicates that the Tx L-Band Synthesizer is not locked. This alarm will flash on during certain modem parameter changes. A solid indication points toward a configuration problem within the modem.
IF Synth PLL	Indicates that the Tx IF Synthesizer is not locked. This alarm will flash on during certain modem parameter changes. A solid indication points toward a configuration problem within the modem.
Ethernet WAN	Indicates that the WAN Port is down.

### 7.2.1.2 Major Rx Alarms

Alarm	Possible Cause
FPGA CFG	Indicates a receive FPGA hardware failure.
DSP CFG	Indicates a receive DSP failure.
SIGNAL LOCK	Indicates that the demod is unable to lock to a signal.
FRAME LOCK	Indicates that the FRMing Unit is unable to find the expected framing pattern.
MULTIFOME LOCK	Indicates that the FRMing Unit is unable to find the expected framing pattern.
LB SYNTH PLL	Indicates that the Rx L-Band Synthesizer is not locked. This alarm will flash on during certain modem parameter changes. A solid indication points toward a configuration problem within the modem.
IF SYNTH PLL	Indicates that the Rx IF Synthesizer is not locked. This alarm will flash on during certain modem parameter changes. A solid indication points toward a configuration problem within the modem.
Ethernet WAN	Indicates that the WAN Port is down.

### 7.2.1.3 Minor Tx Alarms

Alarm	Possible Cause
TERR CLK ACT	Indicates no Terrestrial Clock activity.
TERR DATA ACT	Indicates no Tx Data activity.
TX TERR AIS	Indicates that AIS has been detected in the Tx Data Stream.
DnI FRAME LOCK	When running Drop Mode, indicates that the framing unit is unable to find the exported terrestrial framing pattern.
DnI M-FRAME LOCK	When running Drop Mode, indicates that the framing unit is unable to find the exported terrestrial framing pattern.
TX DVB FRAME LOCK	Indicates that the Tx Input Data Stream FRMing does not match the user selected Tx Terr FRMing. Incorrect Tx Terr FRMing selected. Incorrectly framed Tx Input Data Stream.
BUC CURRENT	Indicates that current is either below or above the threshold limits of the BUC, as specified by the modem. Only active when voltage is enabled.
BUC VOLTAGE	Indicates that the voltage is not functioning correctly when voltage is enabled.

### 7.2.1.4 Minor Rx Alarms

Alarm	Possible Cause
BUFF UNDERFLOW	Indicates that a Doppler Buffer underflow has occurred.
BUFF NEAR EMPTY	Indicates that the Doppler Buffer is about to underflow.
BUFF NEAR FULL	Indicates that the Doppler Buffer is about to overflow.
BUFF OVERFLOW	Indicates that a Doppler Buffer overflow has occurred.
RX DATA ACTIVITY	Indicates that there is no Rx Data activity. For the Ethernet Interface, indicates that no Ethernet port is active (no cable is plugged in).
SAT AIS	Indicates that AIS has been detected in the receive satellite data stream.
DnI FRAME LOCK	Indicates if drop/insert data is frame locked.
DnI M-FRAME LOCK	Indicates if drop/insert data has multiframe lock.
INSERT CRC	Indicates if the Circular Redundancy Check is passing in PCM-30C and PCM-31C Modes.
T1/E1 SIGNALING	Indicates that the T1/E1 Signal is not locked.
IFEC LOCK	Indicates that the Inner Codec is not locked.
OFEC LOCK	Indicates that the Reed-Solomon Decoder is not locked.
INTERLEAVER	Indicates that the Reed Solomon Interleaver is not synchronized.
EBNO (dB)	Indicates that the Eb/No is outside of limits.
IBS BER	Indicates that there are more than one in 1000 bits in error in IBS mode.
RX DVB FRAME LOCK	Indicates that the Rx Satellite Data Stream FRMing is not DVB.
LNB CURRENT	Indicates that current is either below or above the threshold limits of the LNB, as specified by the modem. Only active when voltage is enabled.
LNB VOLTAGE	Indicates that voltage is not functioning correctly when voltage is enabled.

### 7.2.1.5 Drop and Insert Alarms

Alarm	Possible Cause
Multiframe Lock	The insert framer is not in sync.
CRC Lock	An Insert CRC Fault occurred. Valid in T1-ESF, PCM-30, or PCM-30C Modes.
T1 Signaling	An Insert T1 Yellow Fault occurred. Valid in T1-ESF, T1D4, or SCL-96 Modes.
E1 FAS (E1 Frame Acquisition Sync)	An E1 FAS Fault occurred. Valid in PCM-30, or PCM-30C, PCM-31, or PCM-31C Modes.
E1 MFAS (E1 Multi-Frame Acquisition Sync)	An E1 MFAS Fault occurred. Valid in PCM-30, or PCM-30C, PCM-31, or PCM-31C Modes.

### 7.2.1.6 Common Major Alarms

Alarm	Possible Cause
TERR FPGA CFG	Indicates an Interface Card FPGA configuration failure probably caused by a missing, or wrong file.
CODEC FPGA CFG	Indicates Turbo Codec Card FPGA configuration failure probably caused by a missing, or wrong file.
+1.5V RX SUPPLY	Displays the measured voltage of the 1.5 Volt Rx power bus located inside the modem.
+1.5V TX SUPPLY	Displays the measured voltage of the 1.5 Volt Tx power bus located inside the modem.
+3.3V SUPPLY	Displays the measured voltage of the +3.3 Volt power bus located inside the modem.
+5V SUPPLY	Displays the measured voltage of the +5 Volt power bus located inside the modem.
+12V SUPPLY	Displays the measured voltage of the +12 Volt power bus located inside the modem.
+20V SUPPLY	Displays the measured voltage of the +20 Volt power bus located inside the modem.

## 7.2.2 Alarm Masks

The OM20 performs a high degree of self-monitoring and fault isolation. The alarms for these faults are separated into the following three categories:

- Active Alarms
- Common Equipment Alarms
- Backward Alarms

A feature exists that allows the user to ‘Mask’ out certain alarms as explained below. Alarms that are recorded in the event buffer are the same as the alarm buffer.



When an alarm is masked, the GUI interface LEDs and the Fault Relays do not get asserted, but the Alarm will still be displayed. This feature is very helpful during debugging or to lock out a failure of which the user is already aware.

### **7.2.2.1 Active Alarms**

#### **7.2.2.1.1 Major Alarms**

Major Alarms indicate a modem hardware failure. Major Alarms may flash briefly during modem configuration changes and during power-up but should not stay illuminated. Alarms are grouped into Transmit and Receive Alarms - Transmit and Receive are completely independent.

#### **7.2.2.1.2 Minor Alarms**

Minor Alarms indicate that a problem may persist outside the modem such as loss of Terrestrial Clock, loss of terrestrial data activity, or a detected transmit or receive AIS condition. Alarms are grouped into Transmit and Receive Alarms - Transmit and Receive are completely independent.

#### **7.2.2.1.3 Common Equipment Faults**

Common equipment faults indicate hardware or configuration problems in the modem that effect both transmit and receive operation. Most common faults indicate a hardware failure within the modem, such as a bad power supply. Common faults for the External Reference and External Clock indicate a bad modem configuration, not a hardware failure.

### **7.2.2.2 Latched Alarms**

Latched Alarms are used to catch intermittent failures. If a fault occurs, the fault indication will be latched even if the alarm goes away. After the modem is configured and running, it is recommended that the Latched Alarms be cleared as a final step.



# Chapter 8. Technical Specifications

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## 8.1 Data Rates

## 8.2 Modulator

Modulation	BPSK, QPSK, and OQPSK (8PSK, 16QAM Optional)
L-Band Tuning Range	950 to 2050 MHz in 1 Hz Steps
Impedance	50-Ohm
Connector	N-Type female
Return Loss	10 dB Minimum
Output Power	-20 to -45 dB
Output Stability	±0.5 dB Over Time and Temperature
Output Spectrum	Meets IESS 308/309/310 Power Spectral Mask
Spurious	-60 dBc In-Band 950 to 2050 MHz -45 dBc Out-of-Band
On/Off Power Ratio	>60 dB
Scrambler	TT V.35 or IBS (Others Optional)
FEC	Viterbi, K = 7 at 1/2, 3/4 and 7/8 2/3 Rate Trellis Radyne Turbo (Optional) BPSK 21/44 8PSK/16QAM 3/4, 7/8 QPSK 1/2, 3/4, 7/8 (Turbo Supported at all Modulation Types)
Outer Encoder Options	Reed-Solomon INTELSAT (DVB Optional)
Data Clock Source	Internal, Rx Recovered
Internal Stability	5x 10 <sup>-8</sup> Typical

### 8.3 Demodulator

Demodulation	BPSK, QPSK, and OQPSK (8PSK, 16QAM Optional)
L-Band Tuning Range	950 to 2050 MHz in 1 Hz Steps
Impedance	50-Ohm
Connector	N-Type female
Return Loss	10 dB Minimum
Spectrum	INTELSAT IESS 308/309/310 Compliant
Input Level	10 x log (Symbol Rate) - 100, $\pm 12$ dB
Adjacent Channel Rejection Ratio	$> +10$ dBc
Total Input Power	-10 dBm or +40 dBc (the Lesser) @ 256 Kbps
FEC	Viterbi, K = 7 at 1/2, 3/4 and 7/8 Rate, Rate Sequential 1/2, 3/4, 7/8 (Optional) Trellis 2/3 Radyne Turbo (Optional) BPSK 21/44 8PSK/16QAM 3/4, 7/8 QPSK 1/2, 3/4, 7/8 (Turbo Supported at all Modulation Types)
Decoder Options	Reed-Solomon INTELSAT (DVB Optional)
Descrambler	CCITT V.35 or IBS (Others Optional)
Acquisition Range	Programmable $\pm 1$ kHz to $\pm 255$ kHz
Sweep Delay Value	100 msec to 6000 sec. in 100 msec Steps

### 8.4 Plesiochronous Buffer

Size	0 msec to 64 msec
Centering	Automatic on Underflow/Overflow
Centering Modes	IBS: Integral Number of Frames IDR: Integral Number of Multi Frames
Clock	Transmit, Rx Recovered or SCT (Internal)

### 8.5 Monitor and Control

Remote RS-485/Terminal RS-232/Ethernet 10 Base-T/Web Browser

### 8.6 OM20 Drop and Insert (Optional)

Terrestrial Data	1.544 Mbps or 2.048 Mbps, G.732/733
Line Coding	AMI or B8ZS for T1 and HDB3 for E1
Framing	D4, ESF and PCM-30 (PCM-30C) or PCM-31 (PCM- 31C) for E1
Time Slot Selection	n x 64 Contiguous or Arbitrary Blocks for Drop or Insert.
Time Slots	TS1, 2, 3, 4, 5, 6, 8, 10, 12, 15, 16, 20, 24, 30, 31
Data Rates	64, 128, 192, 256, 320, 384, 512, 640, 768, 960, 1024, 1280, 1536, 1920 Kbps

## 8.7 Terrestrial Interfaces

A variety of standard interfaces are available for the OM20 modem in stand-alone applications.

## 8.8 IDR/ESC Interface (Optional)

G.703 T1 (DSX1)	1.544 Mbps, 100-Ohm Balanced, AMI and B8ZS
G.703 E2	8.448 Mbps, 75-Ohm BNC, Unbalanced, HDB3

## 8.9 Ethernet Data Interface

Ethernet Data Interface RJ-45, Auto-Crossover, Auto-Sensing, 10/100 Ethernet Data Port. Complies with IEEE 802.3 and IEEE 802.3u.

## 8.10 Environmental

Prime Power BVC	100 to 240 VAC, 50 to 60 Hz, 250 Watts Maximum with 10 W 48 VDC (Optional)
Operating Temperature	-40 to +50°C, 95% Humidity, Non-Condensing
Storage Temperature	-50 to +60°C, 99% humidity, Non-Condensing

## 8.11 Physical

Size	10" W x 14" L x 4.5" T (25.4 x 35.6 x 11.45 cm)
Weight	15 Pounds (6.8 Kg) Approximate – (modem only)

## 8.12 OM20 Data Rate Limits

### 8.12.1 Non-DVB

Modulation	Code Rate	Min Data Rate	Max Data Rate
BPSK	NONE	4800	10000000
BPSK	VIT 1/2	2400	5000000
BPSK	VIT 3/4	3600	7500000
BPSK	VIT 7/8	4200	8750000
BPSK	SEQ 1/2	2400	2048000
BPSK	SEQ 3/4	3600	2048000
BPSK	SEQ 7/8	4200	2048000

BPSK	TPC 21/44	2400	4772727
QPSK	NONE	9600	20000000
QPSK	VIT 1/2	4800	10000000
QPSK	VIT 3/4	7200	15000000
QPSK	VIT 7/8	8400	17500000
QPSK	SEQ 1/2	4800	2048000
QPSK	SEQ 3/4	7200	2048000
QPSK	SEQ 7/8	8400	2048000
QPSK	TPC 1/2	4582	9545454
QPSK	TPC 3/4	7200	15000000
QPSK	TPC 7/8	8400	17500000
OQPSK	NONE	9600	20000000
OQPSK	VIT 1/2	4800	10000000
OQPSK	VIT 3/4	7200	15000000
OQPSK	VIT 7/8	8400	17500000
OQPSK	SEQ 1/2	4800	2048000
OQPSK	SEQ 3/4	7200	2048000
OQPSK	SEQ 7/8	8400	2048000
OQPSK	TPC 1/2	4582	9545454
OQPSK	TPC 3/4	7200	15000000
OQPSK	TPC 7/8	8400	17500000
8PSK	TRE 2/3	9600	20000000
8PSK	TPC 3/4	10800	20000000
8PSK	TPC 7/8	12600	20000000
8PSK	TPC .495	9504	6312000
8PSK	TPC .793	15225	6312000
16QAM	VIT 3/4	14400	20000000
16QAM	VIT 7/8	16840	20000000
16QAM	TPC 3/4	1440	20000000
16QAM	TPC 7/8	16800	20000000
16QAM	TPC .495	9504	6312000
16QAM	TPC .793	15225	6312000

### 8.12.2 DVB

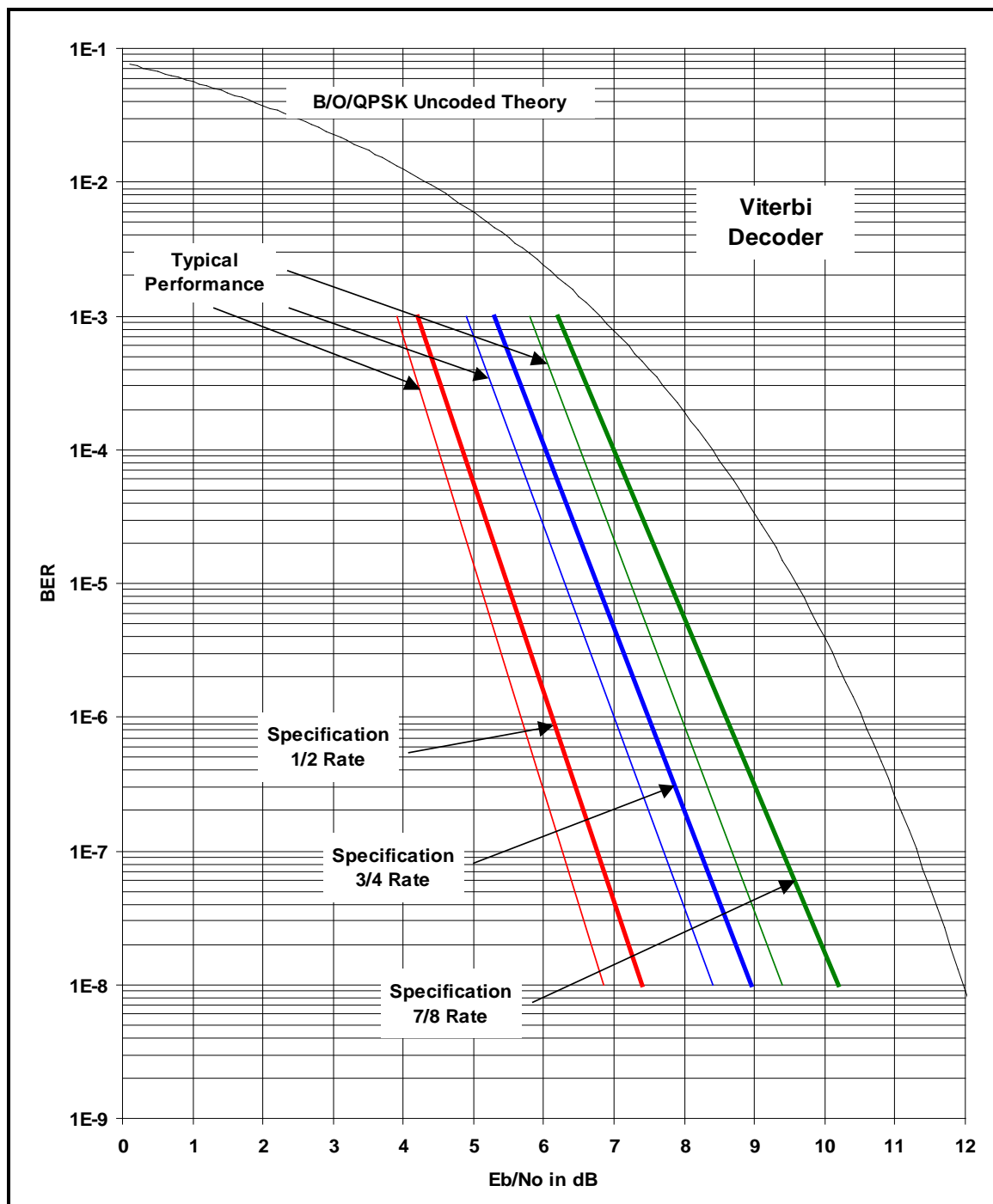
187 Mode			
Modulation	Code Rate	Min Data Rate	Max Data Rate
BPSK	VIT 1/2	2400	4583333
BPSK	VIT 2/3	2934	6111111
BPSK	VIT 3/4	3300	6875000
BPSK	VIT 5/6	3667	7638888
BPSK	VIT 7/8	3850	8020833
QPSK	VIT 1/2	4400	9166666
QPSK	VIT 2/3	5867	12222222
QPSK	VIT 3/4	6600	13750000
QPSK	VIT 5/6	7334	15277777
QPSK	VIT 7/8	7700	16041666
8PSK	TRE 2/3	8800	18333333
8PSK	TRE 5/6	11000	20000000
8PSK	TRE 8/9	11734	20000000
16QAM	TRE 3/4	13200	20000000
16QAM	TRE 7/8	15400	20000000
188 Mode			
Modulation	Code Rate	Min Data Rate	Max Data Rate
BPSK	VIT 1/2	2400	4607843
BPSK	VIT 2/3	2950	6143790
BPSK	VIT 3/4	3318	6911764
BPSK	VIT 5/6	3687	7679738
BPSK	VIT 7/8	3871	8063725
QPSK	VIT 1/2	4424	9215686
QPSK	VIT 2/3	5899	12287581
QPSK	VIT 3/4	6636	13823529
QPSK	VIT 5/6	7373	15359476
QPSK	VIT 7/8	7742	16127450
8PSK	TRE 2/3	8848	18431372
8PSK	TRE 5/6	11059	20000000
8PSK	TRE 8/9	11797	20000000

16QAM	TRE 3/4	13271	20000000
16QAM	TRE 7/8	15483	20000000

204 Mode			
Modulation	Code Rate	Min Data Rate	Max Data Rate
BPSK	VIT 1/2	2400	5000000
BPSK	VIT 2/3	3200	6666666
BPSK	VIT 3/4	3600	7500000
BPSK	VIT 5/6	4000	8333333
BPSK	VIT 7/8	4200	8750000
QPSK	VIT 1/2	4800	10000000
QPSK	VIT 2/3	6400	13333333
QPSK	VIT 3/4	7200	15000000
QPSK	VIT 5/6	8000	16666666
QPSK	VIT 7/8	8400	17500000
8PSK	TRE 2/3	9600	20000000
8PSK	TRE 5/6	12000	20000000
8PSK	TRE 8/9	12800	20000000
16QAM	TRE 3/4	14400	20000000
16QAM	TRE 7/8	16800	20000000

## 8.13 OM20 / BER Specifications

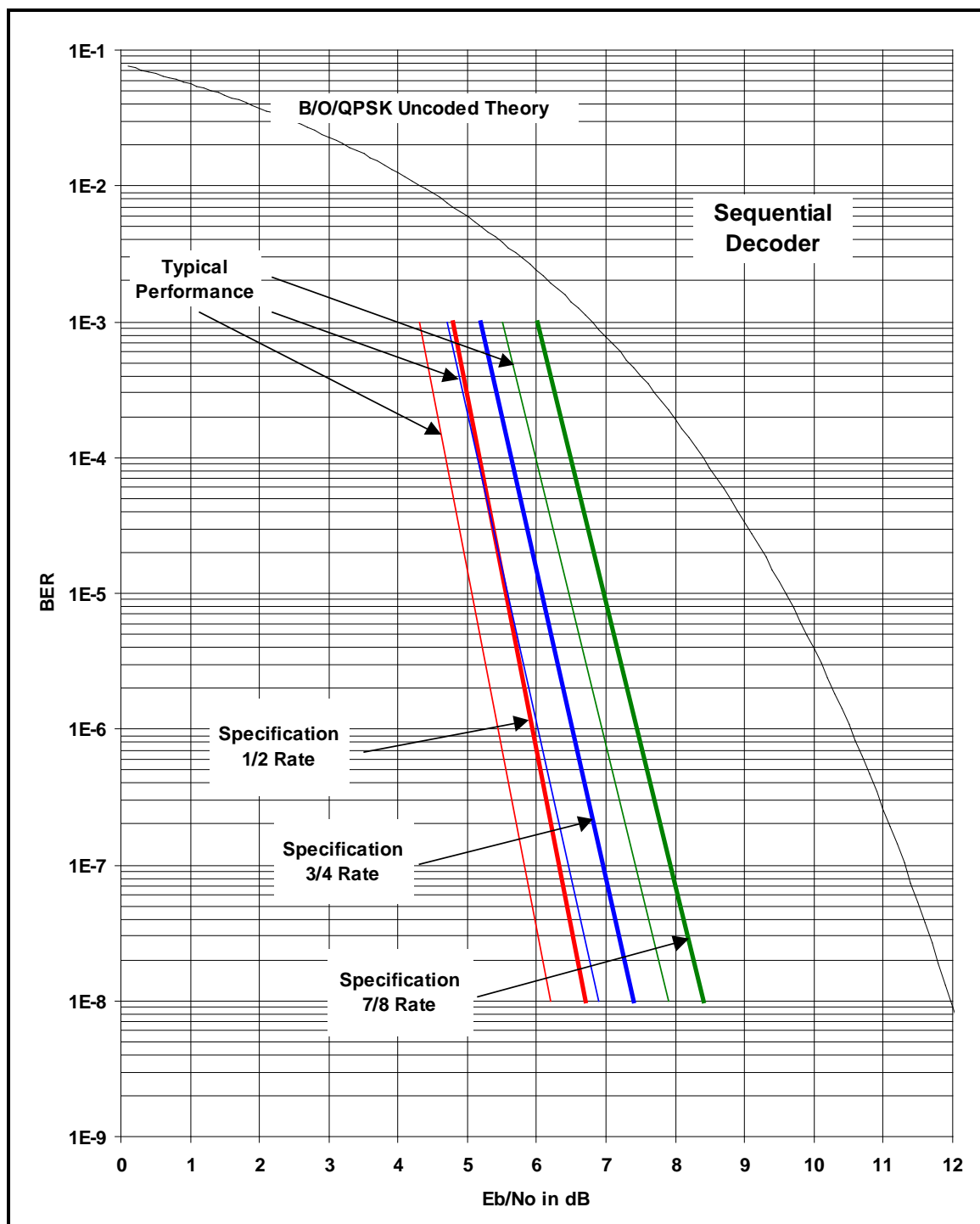
### 8.13.1 BER Performance (Viterbi)



*Note:  $E_b/N_0$  values include the effect of using Differential Decoding and V.35 descrambling.*

**Figure 8-1. OM20 B/O/QPSK BER Performance (Viterbi)**

### 8.13.2 BER Performance (Sequential)

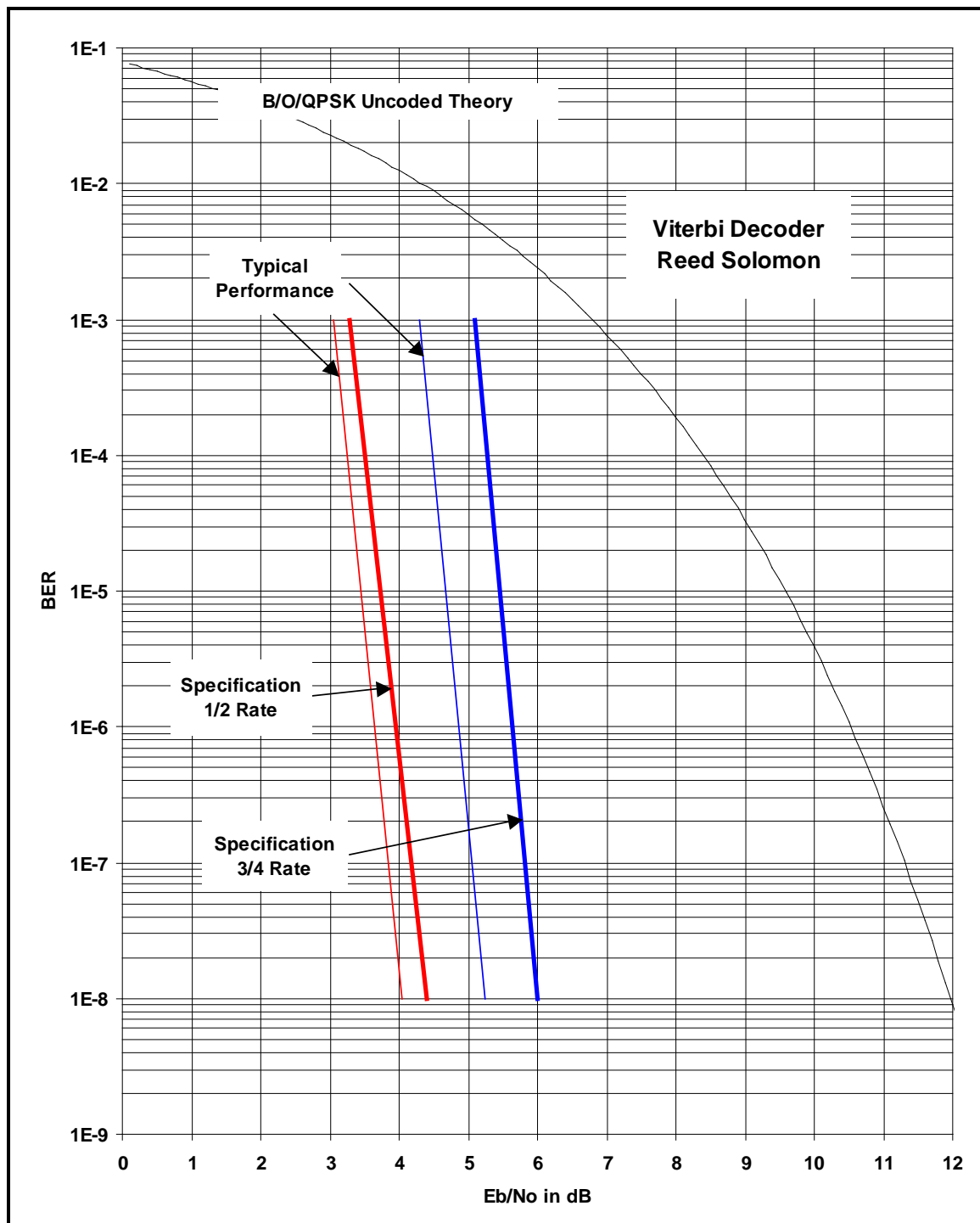


Note:  $E_b/N_0$  values include the effect of using Differential Decoding and V.35 descrambling.

**Figure 8-2. OM20 B/O/QPSK BER Performance (Sequential)**



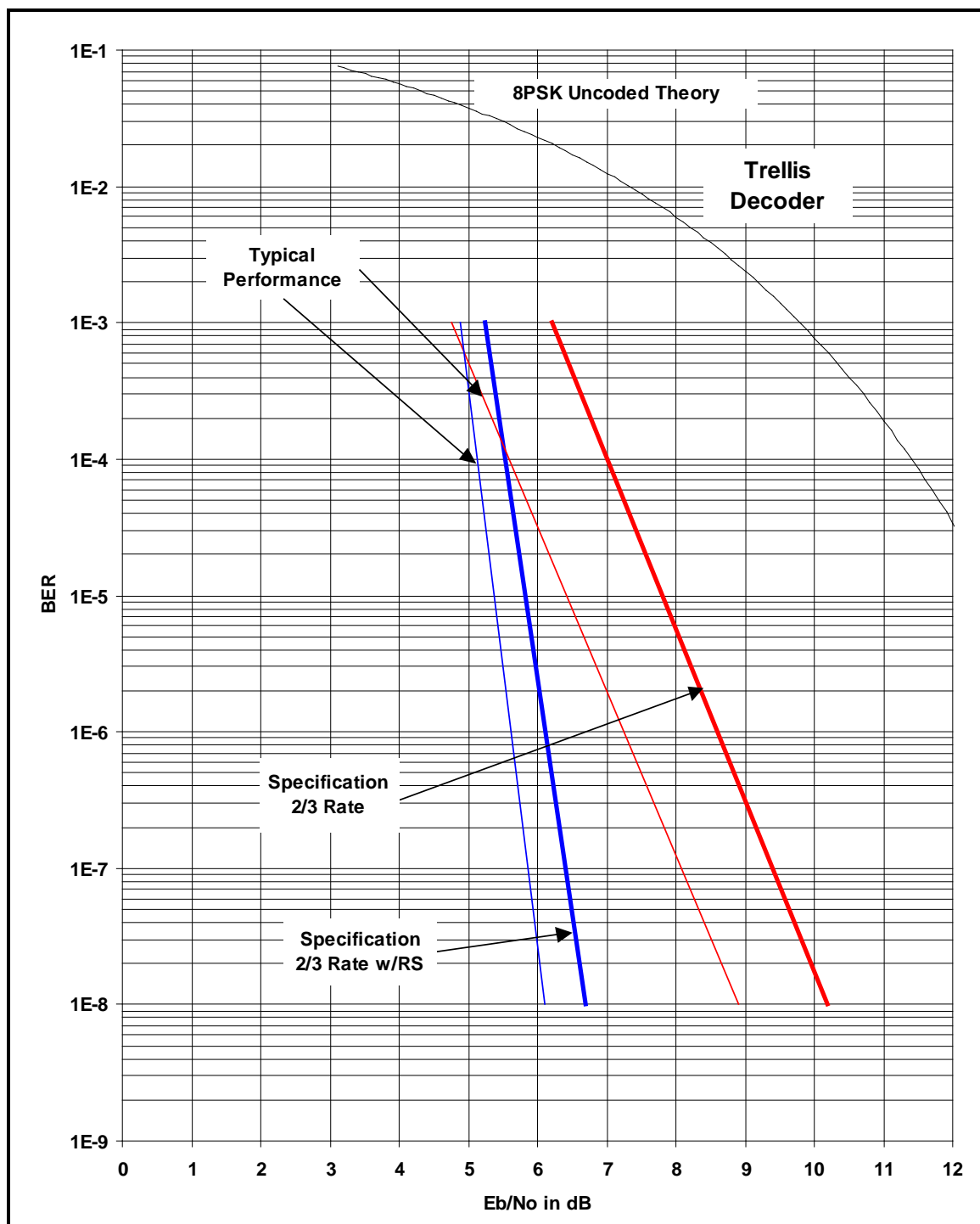
### 8.13.3 BER Performance (Viterbi with Reed-Solomon)



Note: Eb/No values include the effect of using Differential Decoding.

Figure 8-3. OM20 B/O/QPSK BER Performance (Viterbi w/R-S)

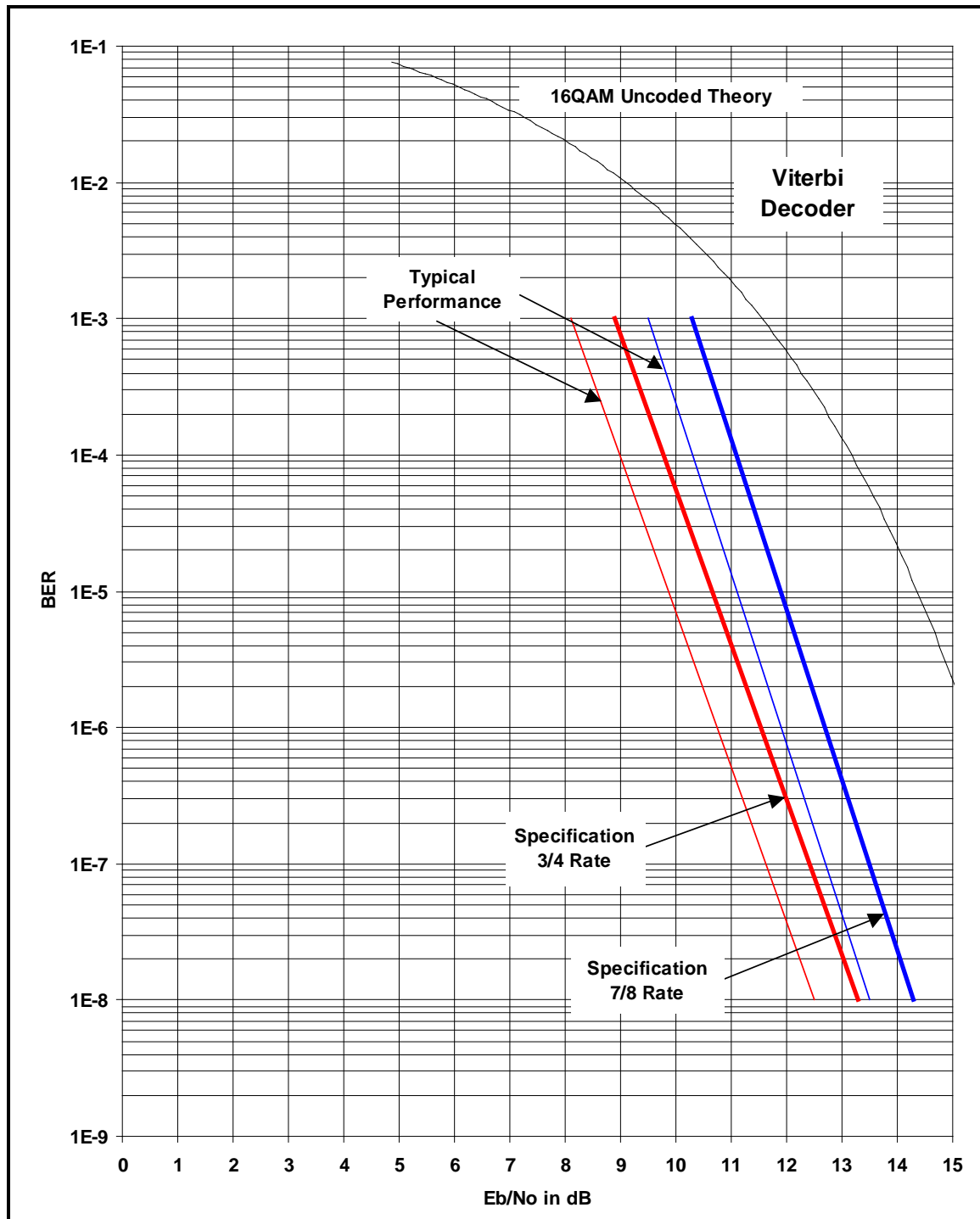
### 8.13.4 BER Performance (8PSK Trellis)



Note:  $E_b/N_0$  values include the effect of using Differential Decoding and V.35 Descrambling.

**Figure 8-4. OM20 8PSK BER Performance (Trellis)**

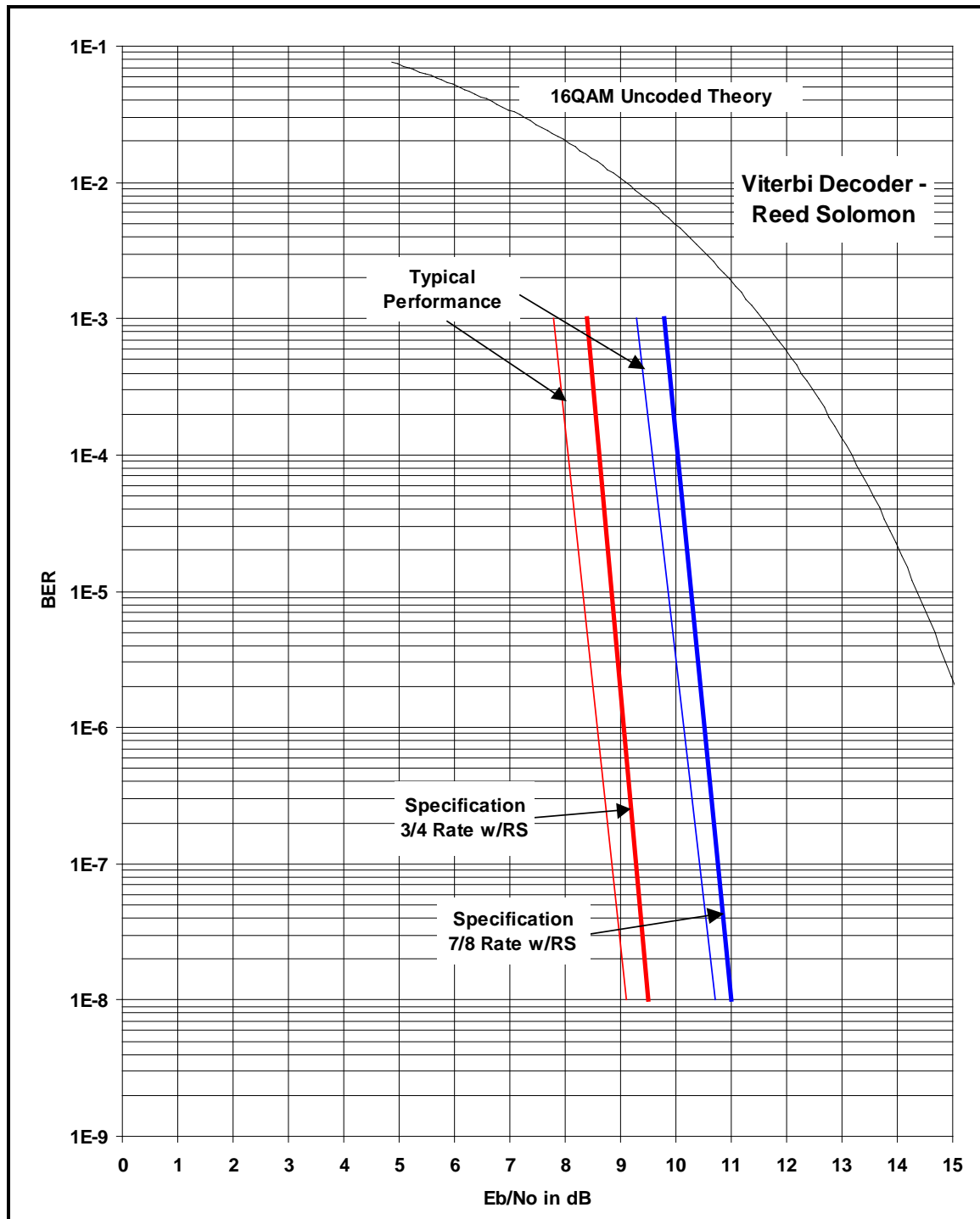
### 8.13.5 BER Performance (16QAM Viterbi)



Note:  $E_b/N_0$  values include the effect of using Differential Decoding and V.35 Descrambling.

**Figure 8-5. OM20 16QAM BER Performance (Viterbi)**

### 8.13.6 BER Performance (16QAM Viterbi with Reed-Solomon)



Note:  $E_b/N_0$  values include the effect of using Differential Decoding.

**Figure 8-6. OM20 16QAM BER Performance (Viterbi w/R-S)**

### 8.13.7 BER Performance ((O)QPSK Turbo)

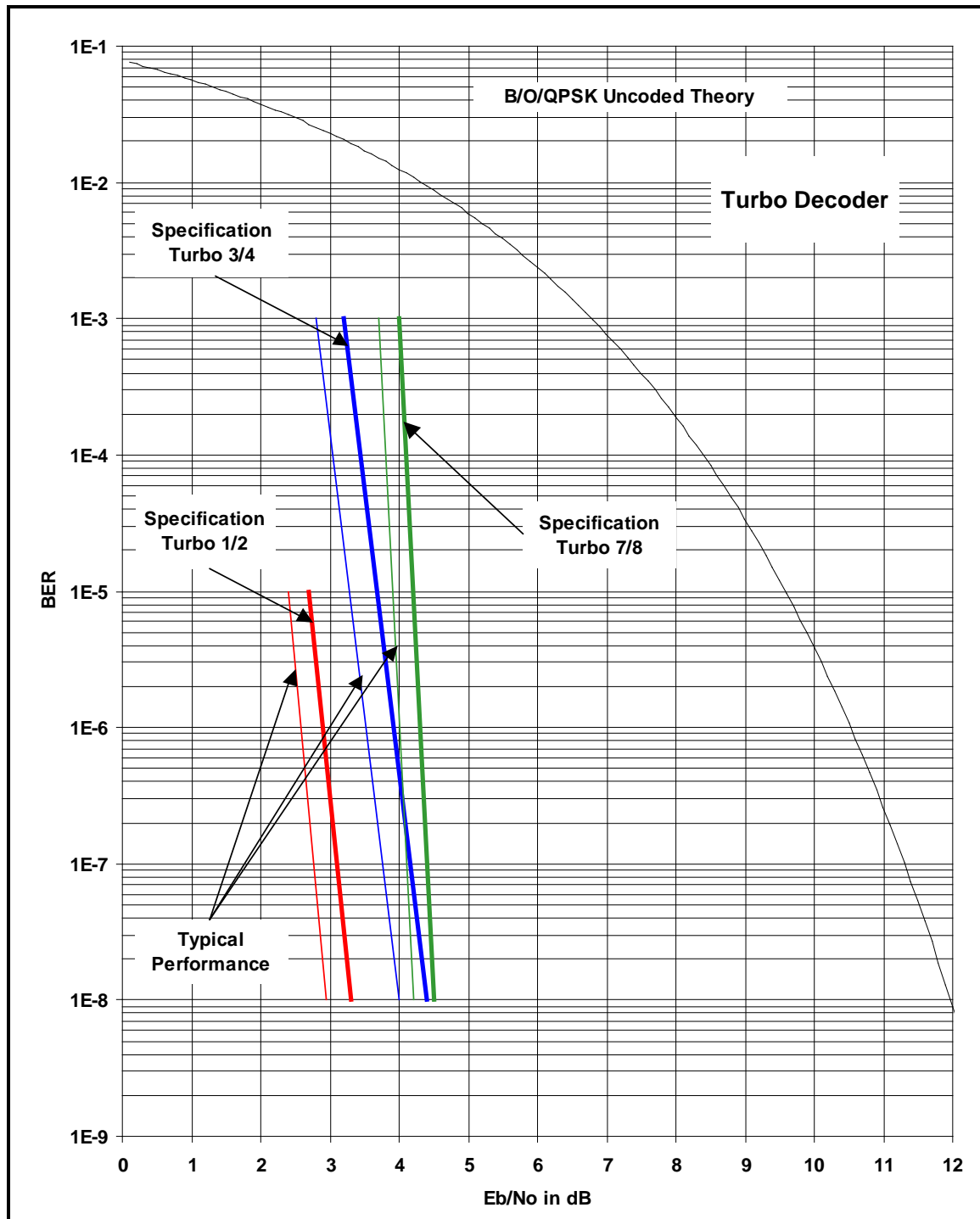


Figure 8-7. OM20 (O)QPSK BER Performance (Turbo)

### 8.13.8 BER Performance (8PSK Turbo)

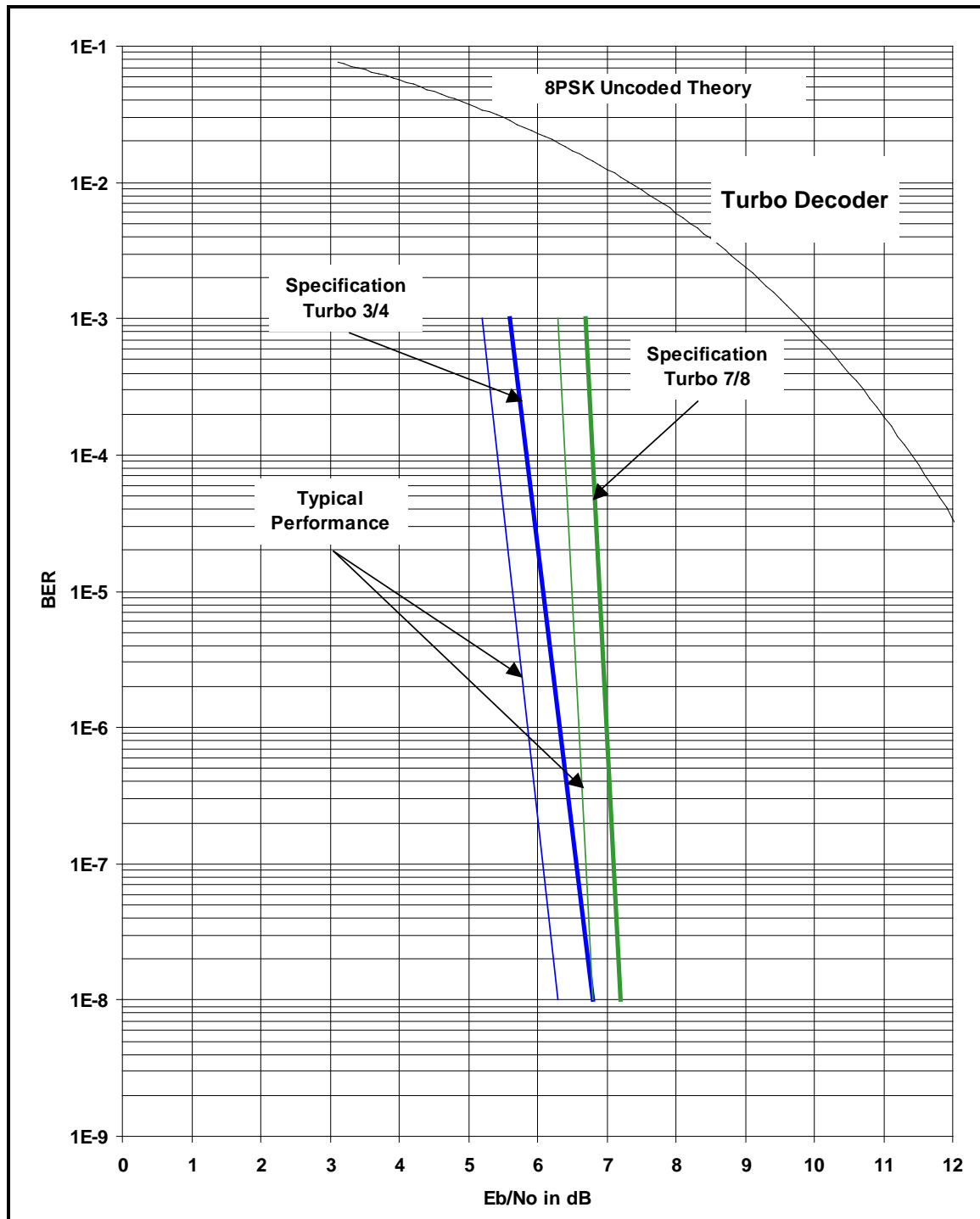


Figure 8-8. OM20 8PSK BER Performance (Turbo)

### 8.13.9 BER Performance (16QAM Turbo)

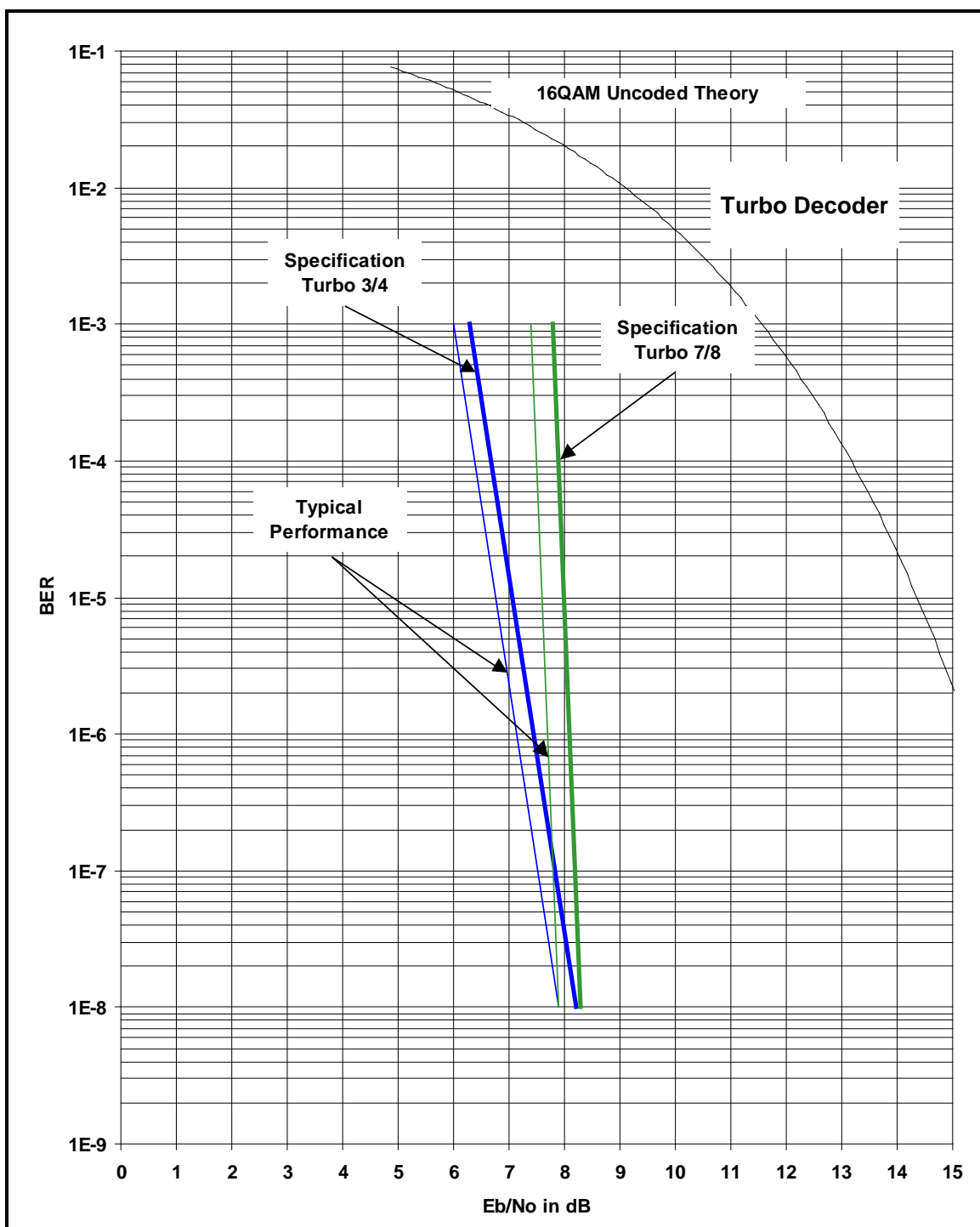


Figure 8-9. OM20 16QAM BER Performance (Turbo)

<b>Table 8-1 - B/O/QPSK BER Performance (Viterbi)</b>						
<b>BER</b>	<b>Specification</b>			<b>Typical</b>		
	<b>1/2 Rate</b>	<b>3/4 Rate</b>	<b>7/8 Rate</b>	<b>1/2 Rate</b>	<b>3/4 Rate</b>	<b>7/8 Rate</b>
1E-3	4.2 dB	5.3 dB	6.2 dB	3.9 dB	4.9 dB	5.8 dB
1E-4	4.8 dB	6.1 dB	7.1 dB	4.5 dB	5.6 dB	6.5 dB
1E-5	5.5 dB	6.8 dB	7.9 dB	5.1 dB	6.3 dB	7.2 dB
1E-6	6.1 dB	7.6 dB	8.6 dB	5.7 dB	7 dB	8.6 dB
1E-7	6.7 dB	8.3 dB	9.3 dB	6.2 dB	7.7 dB	9.4 dB
1E-8	7.4 dB	8.9 dB	10.2 dB	6.8 dB	8.4 dB	10.2 dB
1E-9	8.2 dB	9.7 dB	11 dB	7.4 dB	9.1 dB	10 dB
1E-10	9 dB	10.3 dB	11.7 dB	8.1 dB	9.8 dB	10.5 dB

<b>Table 8-2 - B/O/QPSK BER Performance (Sequential)</b>						
<b>BER</b>	<b>Specification</b>			<b>Typical</b>		
	<b>1/2 Rate</b>	<b>3/4 Rate</b>	<b>7/8 Rate</b>	<b>1/2 Rate</b>	<b>3/4 Rate</b>	<b>7/8 Rate</b>
1E-3	4.8 dB	5.2 dB	6 dB	4.3 dB	4.7 dB	5.5 dB
1E-4	5.2 dB	5.7 dB	6.4 dB	4.7 dB	5.2 dB	5.9 dB
1E-5	5.6 dB	6.1 dB	6.9 dB	5.1 dB	5.6 dB	6.4 dB
1E-6	5.9 dB	6.5 dB	7.4 dB	5.4 dB	6.1 dB	6.9 dB
1E-7	6.3 dB	7 dB	7.9 dB	5.8 dB	6.5 dB	7.4 dB
1E-8	6.7 dB	7.4 dB	8.4 dB	6.2 dB	6.9 dB	7.9 dB
1E-9	7.1 dB	7.8 dB	8.9 dB	6.6 dB	7.4 dB	8.4 dB
1E-10	7.4 dB	8.3 dB	9.4 dB	6.9 dB	7.8 dB	8.9 dB

<b>Table 8-3 - B/O/QPSK BER Performance (Viterbi - w/RS)</b>						
<b>BER</b>	<b>Specification</b>			<b>Typical</b>		
	<b>1/2 Rate</b>	<b>3/4 Rate</b>	<b>7/8 Rate</b>	<b>1/2 Rate</b>	<b>3/4 Rate</b>	<b>7/8 Rate</b>
1E-3	3.3 dB	5.1 dB	-	3 dB	4.3 dB	5.3 dB
1E-4	3.5 dB	5.3 dB	-	3.2 dB	4.5 dB	5.7 dB
1E-5	3.8 dB	5.4 dB	6.5 dB	3.4 dB	4.7 dB	6 dB
1E-6	4.1 dB	5.6 dB	6.7 dB	3.6 dB	4.9 dB	6.4 dB
1E-7	4.2 dB	5.8 dB	6.9 dB	3.8 dB	5.1 dB	6.7 dB
1E-8	4.4 dB	6 dB	7.2 dB	4 dB	5.3 dB	7.1 dB
1E-9	4.7 dB	6.1 dB	7.5 dB	4.2 dB	5.4 dB	7.4 dB
1E-10	5 dB	6.3 dB	7.8 dB	4.4 dB	5.6 dB	7.7 dB



<b>Table 8-4 - 8PSK BER Performance (Trellis)</b>				
<b>BER</b>	<b>Specification</b>		<b>Typical</b>	
	<b>2/3 Rate</b>	<b>2/3 Rate w/RS</b>	<b>2/3 Rate</b>	<b>2/3 Rate w/RS</b>
1E-3	6.2 dB	5.2 dB	4.8 dB	4.9 dB
1E-4	7 dB	5.5 dB	5.6 dB	5.1 dB
1E-5	7.8 dB	5.8 dB	6.4 dB	5.4 dB
1E-6	8.7 dB	6.2 dB	7.2 dB	5.6 dB
1E-7	9.5 dB	6.5 dB	8.1 dB	5.8 dB
1E-8	10.2 dB	6.7 dB	8.9 dB	6.1 dB
1E-9	11.1 dB	6.9 dB	9.7 dB	6.3 dB
1E-10	11.9 dB	7.3 dB	10.5 dB	6.6 dB

<b>Table 8-5 - 16QAM BER Performance (Viterbi)</b>				
<b>BER</b>	<b>Specification</b>		<b>Typical</b>	
	<b>3/4 Rate</b>	<b>7/8 Rate</b>	<b>3/4 Rate</b>	<b>7/8 Rate</b>
1E-3	8.9 dB	10.3 dB	8.1 dB	9.5 dB
1E-4	9.8 dB	11.1 dB	9 dB	10.3 dB
1E-5	10.7 dB	11.9 dB	9.9 dB	11.1 dB
1E-6	11.5 dB	12.7 dB	10.7 dB	11.9 dB
1E-7	12.4 dB	13.5 dB	11.6 dB	12.7 dB
1E-8	13.3 dB	14.3 dB	12.5 dB	13.5 dB
1E-9	14.2 dB	15.1 dB	13.4 dB	14.3 dB
1E-10	15 dB	15.9 dB	14.2 dB	15.1 dB

<b>Table 8-6 - 16QAM BER Performance (Viterbi)</b>				
<b>BER</b>	<b>Specification</b>		<b>Typical</b>	
	<b>3/4 Rate</b>	<b>7/8 Rate</b>	<b>3/4 Rate</b>	<b>7/8 Rate</b>
1E-3	8.4 dB	9.8 dB	7.8 dB	9.3 dB
1E-4	8.6 dB	8.1 dB	8.1 dB	9.6 dB
1E-5	8.9 dB	8.3 dB	8.3 dB	9.9 dB
1E-6	9.1 dB	8.6 dB	8.6 dB	10.2 dB
1E-7	9.3 dB	8.8 dB	8.8 dB	10.4 dB
1E-8	9.5 dB	9.1 dB	9.1 dB	10.7 dB
1E-9	9.8 dB	9.3 dB	9.3 dB	11 dB
1E-10	10 dB	9.6 dB	9.6 dB	11.3 dB

Table 8-7 - (O)QPSK BER Performance (Turbo)						
BER	Specification			Typical		
	Turbo 1/2	Turbo 3/4	Turbo 7/8	Turbo 1/2	Turbo 3/4	Turbo 7/8
1E-3	TBD	3.2 dB	4 dB	TBD	2.8 dB	3.7 dB
1E-4	TBD	3.4 dB	4.1 dB	TBD	3 dB	3.8 dB
1E-5	2.7 dB	3.6 dB	4.2 dB	2.4 dB	3.2 dB	3.9 dB
1E-6	2.9 dB	3.8 dB	4.3 dB	2.6 dB	3.4 dB	4 dB
1E-7	3.1 dB	4.1 dB	4.4 dB	2.8 dB	3.7 dB	4.1 dB
1E-8	3.3 dB	4.4 dB	4.5 dB	3 dB	4 dB	4.2 dB

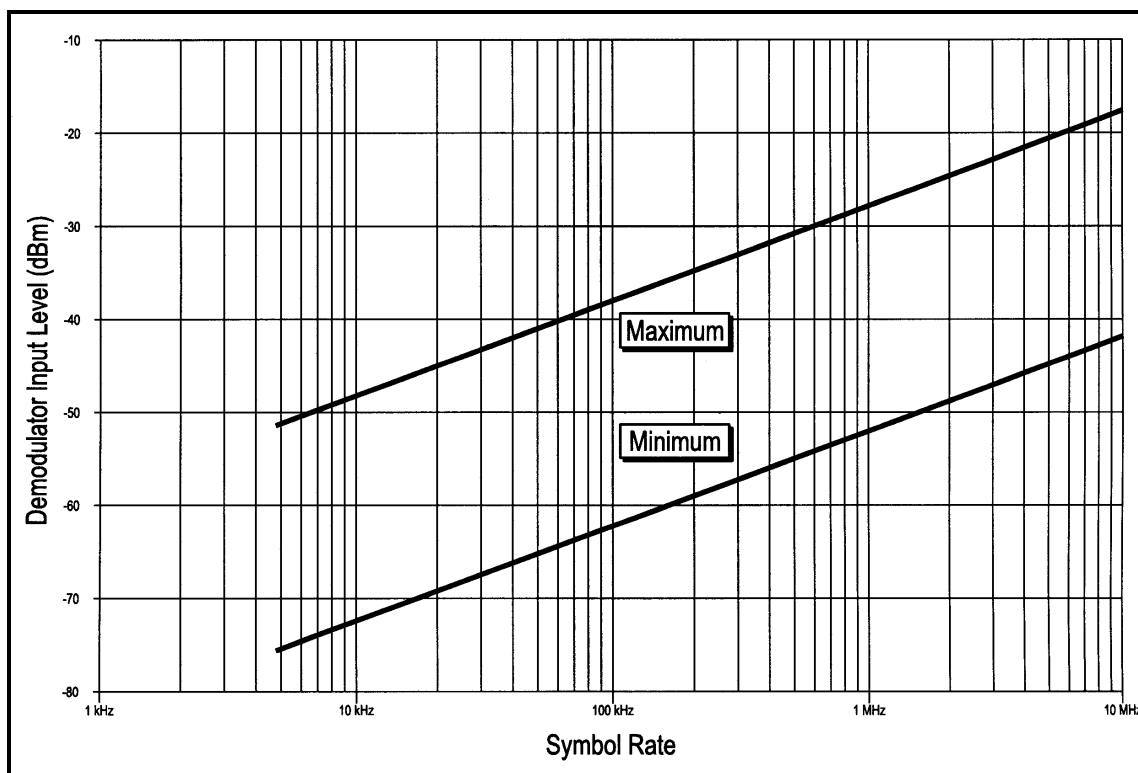
Table 8-8 - 8PSK BER Performance (Turbo)				
BER	Specification		Typical	
	Turbo 3/4	Turbo 7/8	Turbo 3/4	Turbo 7/8
1E-3	5.6 dB	6.7 dB	5.2 dB	6.3 dB
1E-4	5.8 dB	6.8 dB	5.4 dB	6.4 dB
1E-5	6 dB	6.9 dB	5.6 dB	6.5 dB
1E-6	6.2 dB	7 dB	5.8 dB	6.6 dB
1E-7	6.4 dB	7.1 dB	6 dB	6.7 dB
1E-8	6.8 dB	7.2 dB	6.3 dB	6.8 dB

Table 8-9 - 16QAM BER Performance (Turbo)				
BER	Specification		Typical	
	Turbo 3/4	Turbo 7/8	Turbo 3/4	Turbo 7/8
1E-3	6.3 dB	7.8 dB	6 dB	7.4 dB
1E-4	6.7 dB	7.9 dB	6.4 dB	7.5 dB
1E-5	7 dB	8 dB	6.7 dB	7.6 dB
1E-6	7.4 dB	8.1 dB	7.1 dB	7.7 dB
1E-7	7.8 dB	8.2 dB	7.5 dB	7.8 dB
1E-8	8.2 dB	8.3 dB	7.9 dB	7.9 dB

Table 8-10. Open Network Performance							
BER	Specification			Typical			
	IBS	IDR	IDR	IBS	IBS	IDR	IDR
	1/2 Rate	3/4 Rate	7/8 Rate	1/2 Rate	3/4 Rate	3/4 Rate	7/8 Rate
1E-3	4.1 dB	5.2 dB	6.2 dB	3.25 dB	4.2 dB	4.35 dB	5.8 dB
1E-4	4.6 dB	6.0 dB	7.1 dB	3.8 dB	4.9 dB	5.25 dB	6.5 dB
1E-4	5.3 dB	6.7 dB	7.9 dB	4.6 dB	5.6 dB	5.9 dB	7.2 dB
1E-6	6.0 dB	7.5 dB	8.6 dB	5.2 dB	6.3 dB	6.6 dB	7.9 dB
1E-7	6.6 dB	8.2 dB	9.3 dB	5.9 dB	6.9 dB	7.3 dB	8.6 dB
1E-8	7.1 dB	8.7 dB	10.2 dB	6.4 dB	7.5 dB	7.8 dB	9.4 dB

### 8.13.10 Input Level

Refer to Figure 8-10 for the OM20 power threshold limits.



**Figure 8-10 Demodulator Input Level Specification**

**Notes:**

[illegible]

# Appendix A. Product Options

---

## A.1 Hardware Options

The following enhanced interface cards are available. All options must be factory installed.

### A.1.1 G.703/IDR ESC Interface

The OM20 can be equipped with a G.703/IDR ESC Interface. Factory installed option

### A.1.2 Turbo Card

The OM20 can be equipped with an optional Turbo Codec Outer Code. This option must be installed at the factory and may require other options. Factory upgrade only.

### A.1.3 Internal High Stability

The OM20 is equipped with a  $5 \times 10^{-8}$  or better Stability Frequency Reference. Standard option.

### A.1.4 DC Input Prime Power

Allows for an optional DC Input Power Source. Factory installed option.

### A.1.5 Ethernet Data Interface

The Ethernet interface is supported by an RJ-45, Auto-Crossover, Auto-Sensing, 10/100 Ethernet Data Ports. This interface complies with IEEE 802.3 and IEEE 802.3u. Factory installed option

### A.1.6 Sequential Interface

The OM20 can be equipped with a Sequential option. Factory installed option

---

## A.2 Customized Options

The OM20 may be customized for specific customer requirements. Most modifications or customization can be accomplished by means of firmware/software modifications.

The following are examples of the types of customization available to the user:

- Customized Data Rates.
- Customized Scrambler/Descramblers.
- Customized Overhead Framing Structures.
- Customized Modulation Formats.
- Customized Uses for the ES-ES Overhead Channel.

Contact Comtech EF Data Customer Serve or Sales Department at (480) 333-4357 for all requests.

# Appendix B. Software Upgrade Procedure

The outdoor modem software may be upgraded via the terminal or the web interface.

---

## B.1 Terminal Software Upgrade

The OM20 Outdoor Modem offers the ability to perform field upgrades of the modem's feature set quickly and easily from the Terminal Port. Purchased upgrades will become part of the modems permanent configuration. Demonstration upgrades will enable the optional features for a 30-day evaluation period.

---

## B.2 Required Equipment

The OM20 Universal Satellite Modem is the only equipment required for this procedure.

---

## B.3 Upgrade Procedure

The following paragraphs describe the procedure for permanently updating the feature set of the OM20 Universal Satellite Modem

1. The following steps allow users to quickly determine from the GUI Interface whether or not the desired feature(s) are supported by the hardware currently installed in the modem.

Using the GUI interface navigate to the Features menu under "System" gel-tab. Click on "features". This will show the available features and all features checked are the purchased/installed features.

2. Contact Comtech EF Data Customer Service with the Unit ID and Desired Upgrades. The modem's Unit ID can be found in the Terminal interface as follows:
  - a. From the main menu, the Features menu.
  - b. "Feature Id: is the unit ID number

The value displayed on the top line of this menu is the 12-digit Unit ID. It is displayed as 3 sets of 4 digits in a dot-delineated format as follows:

1 2 3 4 . 1 2 3 4 . 1 2 3 4

Your Comtech EF Data Sales Representative will ask you for this number along with your desired feature set upgrades when placing your order.

Once your order has been processed, you will be issued a 12-digit feature set upgrade code. This code is only good on the modem for which it was ordered. To enter this code from the terminal port, perform the following:

- a. From the “Enter Selection Number” line type in 45.
- b. Press Enter.
- c. Enter the new code and press “Enter”
- d. Your system is now up graded.

If the code entered is correct, the display will display **CODE ACCEPTED**, otherwise the display will display **INVALID CODE**.



*Care should be taken to insure that the upgrade code is entered properly. After three unsuccessful attempts to enter a code, the upgrade and demonstration capability will be locked out and it will be necessary to cycle power on the modem in order to continue.*



## B.4 Demonstration Procedure

The procedure for enabling a 30-day demo of the OM20 options is similar to the procedure used for permanently updating the modems feature set. The one big difference being that at the end of 30 days, the demo features will automatically be disabled and the modem will revert back to its permanent configuration.



***At the end of the demonstration period, when the modem reverts back to its permanent configuration an interrupt in traffic will occur, regardless of whether or not a demo enabled features was being run at the time. In addition, operator intervention may be required to restore the data paths. In order to avoid this interruption in service, the user can cancel the demonstration at any time by following the instructions outlined in the section on “Canceling Demonstration Mode.”***

1. The following steps allow users to quickly determine from the GUI Interface whether or not the desired feature(s) are supported by the hardware currently installed in the modem.

Using the GUI interface navigate to the Features menu under “System” gel-tab. Click on “features”. This will show the available features and all features checked are the purchased/installed features.

2. Contact Radyne with the Unit ID and Request a Demonstration. The modem’s Unit ID can be found in the Terminal interface as follows:
  - a. From the main menu, the Features menu.
  - b. “Feature Id: is the unit ID number

The value displayed on the top line of this menu is the 12-digit Unit ID. It is displayed as 3 sets of 4 digits in a dot-delineated format as follows:

1 2 3 4 . 1 2 3 4 . 1 2 3 4

Your Radyne Sales Representative will ask you for this number along with the features you wish to demo.

3. Once your order has been processed, you will be issued a 12-digit demonstration code. This code can only be used one time and it is only good on the modem for which it was originally requested. To enter this code, perform the following:
  - a. From the “Enter Selection Number” line type in 45.
  - b. Press Enter.
  - c. Enter the new code and press “Enter”
  - d. Your system is now up graded.

If the code entered is correct, the display will display CODE ACCEPTED, otherwise the display will read INVALID CODE



***Care should be taken to insure that the demonstration code is entered properly. After three unsuccessful attempts to enter a code, the upgrade and demonstration capability will be locked out and it will be necessary to cycle power on the modem in order to continue.***

## B.5 Canceling Demonstration Mode

At any time, a demonstration may be canceled and have the modem return to its normal operation. Once the demonstration has been canceled, it cannot be restarted using the old demonstration code. In order to restart a demonstration, it will be necessary to obtain a new demonstration code.

To cancel a demonstration from the Terminal Port, perform the following:

1. From the Terminal Main Menu, type in 19 (Features) and press “Enter”.
2. From the “Enter Selection Number” line type in 45.
3. Press <ENTER>.
4. Using the numeric keypad, enter 0000 0000 0000
5. Press < ENTER>.

The modem will immediately terminate the demonstration and the feature set will revert back to the permanent configuration.

The Mod and Demod Test LED's will stop flashing.

## B.6 Web Browser Software Upgrade

## B.7 Monitor and Control

All modem settings can be monitored and controlled through the browser based on the user access rights. The goal is an easy-to-use navigation scheme that would enable users to view current modem status and easily access the modem's controls.

1. From the modem introduction page, click the MONITOR & CONTROL tab.
2. If not already logged on, enter your username and password on the logon popup, and then press the Enter key.

The screenshot shows the OM20 Outdoor Modem web interface. At the top, there's a header with the text "Hello 'admin'" and navigation links: "Introduction | Password Setup | IP Administration | Sign Out". Below this is a status bar with the "RADYNE" logo and "OM20 Outdoor Modem". A row of status indicators includes: MOD (TRANSMIT ON, MAJOR ALARM, TEST MODE), DEMOD (SIGNAL LOCK, MAJOR ALARM, TEST MODE), EVENT (POWER, FAULT, REMOTE), and MINOR ALARM. Below the status bar are tabs: TRANSMIT, RECEIVE, INTERFACE, MONITOR, ALARMS, SYSTEM (highlighted), and TEST.

The main content area is titled "SYSTEM / FEATURES". It contains a "Key Code" section with input fields for "293", "4506", and "115", and a "Submit" button. To the right is a "Mode" section with a dropdown menu set to "NORMAL" and a "Cancel Demo" button.






The settings are organized into two columns. The left column lists features with status icons (green checkmark for enabled, red X for disabled):

- 512 Kbps: Data Rate bps Limit
- 5 Mbps: Data Rate bps Limit
- 20 Mbps: Data Rate bps Limit
- TPC 5 Mbps: Turbo Product Code 5 Mbps
- TPC 52 Mbps: Turbo Product Code 52 Mbps
- Rx IF: 50 to 90 and 100 to 180 MHz
- Rx L-Band: Freq > 950 Mhz
- ReedSolomon: IntelSat Outer Coding
- DVB: EH301-210 and EH300-421
- IDR: IntelSat IESS-308/310/315
- Enhanced Async: Uses IBS OH Signaling bytes
- EDMAC: Proprietary Framing
- Sequential: Rates 1/2, 3/4, and 7/8
- 16QAM: Amplitude Modulation

The right column lists features with status icons:

- 1 Mbps: Data Rate bps Limit
- 10 Mbps: Data Rate bps Limit
- 52 Mbps: Data Rate bps Limit
- TPC 20 Mbps: Turbo Product Code 20 Mbps
- Tx IF: 50 to 90 and 100 to 180 MHz
- Tx L-Band: Freq > 950 Mhz
- RS Custom: Custom (H, K) Settings
- IBS: IntelSat IESS-309/314/315
- Drop & Insert: Terr Data 1.544 or 2.048 Mbps
- AUPC: Automatic Power Control
- OM73 Scrambler: OM73 Compatible Scrambler
- 8PSK: 8-Phase Shift Keying Modulation

The Web Browser menu allows viewing of actively enabled features. Each feature displays a series of symbols that describe feature status. The following symbols indicate:

	Installed
	No hardware available. Requires hardware for upgrade.
	Feature is in Demo Mode and will expire.
	Key Code Required
	Call customer service. Feature is enabled for customer use, but the OM20 hardware required has not been detected or has failed.

Features upgrades can also be implemented through the Web Browser interface.

# Appendix C. Carrier Control

---

## C.1 States

The OM20 transmitter will turn off the carrier output automatically when the modem determines there is a major alarm. This is done to prevent the carrier from outputting an unknown spectrum and possibly disturbing adjacent carriers. This automatic drop of the carrier can be overridden by masking the alarm that is causing the fault. This will keep the modulator output spectrum transmitting, even when the fault occurs. The following Carrier Control states are available:

Carrier **OFF**  
Carrier **ON**  
Carrier **AUTO**  
Carrier **VSAT**  
Carrier **RTS**

---

## C.2 Carrier Off

Modulator output is disabled.

---

## C.3 Carrier On

Modulator output is turned off before reprogramming modulator functions that may alter the output spectrum through the front panel, and the user is required to enter “Yes” to re-enable output after the change. When using the terminal, the modulator is turned off while re-programming modulator functions that may alter the output spectrum, and the user is required to manually turn on the output after the reprogramming.

---

## **C.4 Carrier Auto**

Modulator output is turned off before reprogramming modulator functions that may alter the output spectrum through the front panel, but the output is automatically turned on after the change. When using the terminal, the modulator is turned off while re-programming modulator functions that may alter the output spectrum, and but the output is automatically turned on after the change.

---

## **C.5 Carrier VSat**

Modulator output is turned off before reprogramming modulator functions that may alter the output spectrum through the front panel, and the user is required to enter “Yes” to re-enable output after the change. When using the terminal, the modulator is turned off while re-programming modulator functions that may alter the output spectrum, and the user is required to manually turn on the output after the reprogramming (same as “Carrier On”). Additionally “VSat” mode disables the modulators output when the modems demodulator does not have signal lock. When signal lock returns to the demodulator, the modems modulator turns the carrier back on.

---

## **C.6 Carrier RTS**

Modulator output is turned off before reprogramming modulator functions that may alter the output spectrum through the front panel, and the user is required to enter “Yes” to re-enable output after the change. When using the terminal, the modulator is turned off while re-programming modulator functions that may alter the output spectrum, and the user is required to manually turn on the output after the reprogramming (same as “Carrier On”). Additionally “RTS” (Request To Send) mode enables the modulator’s output based on the RTS lead of the data interface. When RTS is enabled on the data interface, the modulator turns on the carrier, when the RTS is disabled the modulator turns off the carrier.

# Appendix D. Quick Start Guide

---

## D.1 Introduction

This section provides quick setup instructions to access the Web Browser through the RJ45 Ethernet interface. The Web user interface allows for complete monitoring and control of all modem parameters and functions via a 10BaseT Ethernet connection. For more details on the various WEB configurations and a description of all the available selections, please refer to the manuals.

---

## D.2 Required Items

- Modem
- RJ45 to RJ45 cable
- Computer
- Default Plug (J2)



**IMPORTANT**

*The Web Browser menus for the OM20 can only be accessed utilizing Microsoft Internet Explorer 6 or greater.*

---

## D.3 Web Interface Setup Guidelines

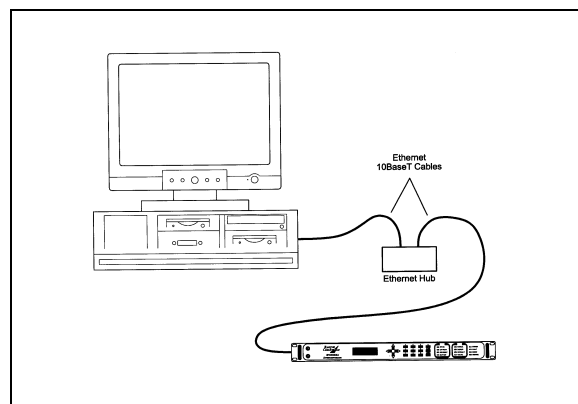
### D.3.1 Preparing the OM-20 for Web Setup

The unit is shipped from the factory with specific IP defaults. The factory defaults are set to an unreachable state to minimize any adverse effects to the user's network. In order for the user to change the IP addresses to an accessible address the user must first install the Reset Plug onto J2 that is supplied with the unit. This will change the IP network setting that the user can access.

1. Turn off power to the OM-20.
2. Install the Reset mating connector on J2 port.
3. Turn on power to the OM-20 and allow it to run for 2 minutes.
4. Turn off power to OM-20 and remove the Reset mating connector from J2.
5. The IP addresses of the OM-20 are now configured to the following:

<b>Boot Modes:</b>	<b>IPTEST</b>
Bootp Server Tag:	206
IP Address Mask:	255.255.255.000
Modem IP Address:	192.168.0.238
Server IP Address:	192.168.000.101
Router IP Address:	192.168.000.102

6. In order for the computer to recognize the modem, the computers subnet Mask must match the Subnet Mask of the modem. The IP Address Mask is 255.255.255.000. To ensure the safety of the network, it may be necessary to contact the network administrator.
7. Turn on the unit. The unit is now ready to connect to the computer. Connect the RJ45 cable from the OM-20 to the computer/router/bridge as illustrated in Figure 1.



**Figure 1. Ethernet Connection**

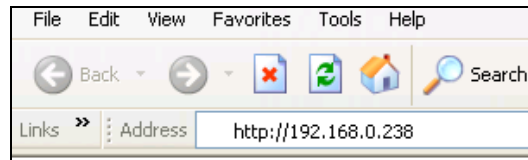
8. Initiate PING test to ensure there is communication between the modem and the computer

Example: ping 192.168.0.238

If everything is functioning correctly, replies from the modem will appear on the computer screen along with the time it took to respond. If unsuccessful, verify the following:

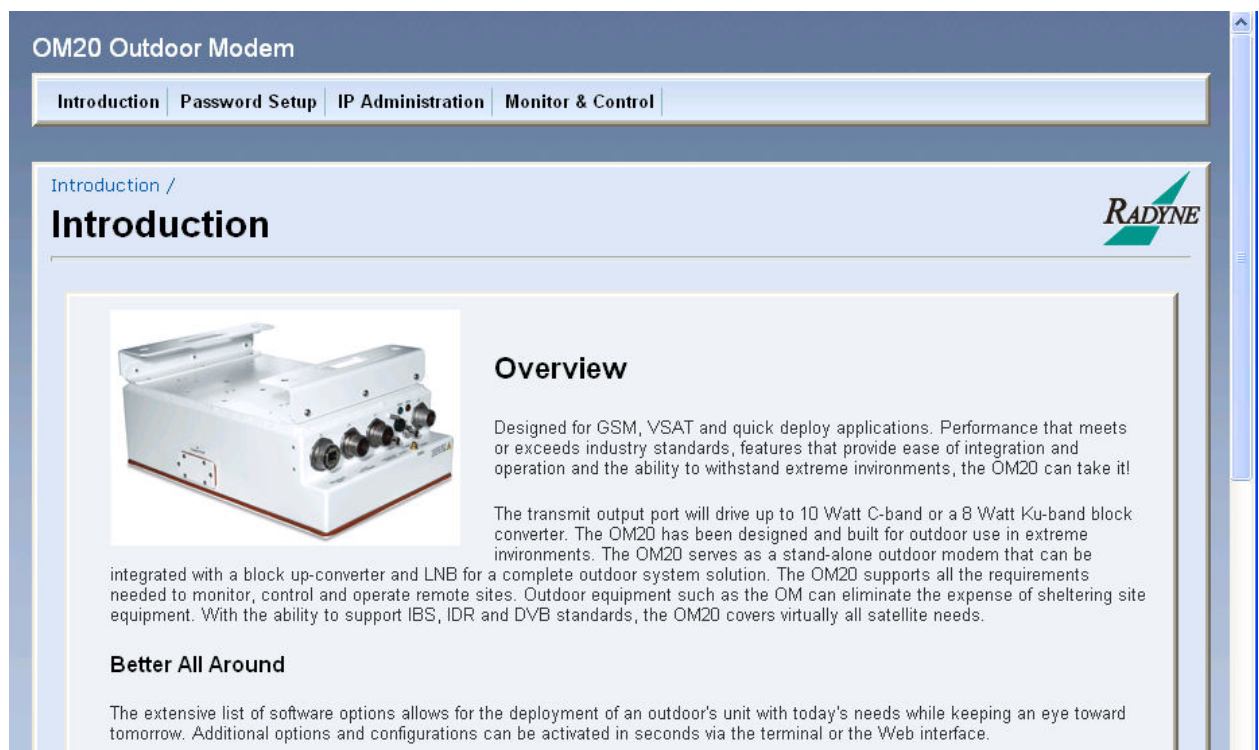


- A. The cables are secured.
  - B. The Link Light is illuminated.
  - C. The IP Address that is used matches the Modem's IP Address.
  - D. The Server and Modem are on the same subnet.
9. Start the Internet browser on the computer and enter the IP Address 192.168.0.238 in the address field then press the Enter key per Figure 2.



**Figure 2. Internet Browser Address**

10. The Web Browser should be displayed on your computer screen. The modem index page will be displayed per Figure 3. No special access is required. General information on the modem, features, capabilities, and available options are listed. Complete technical specifications and product options are also available in a PDF format. Links to the Radyne Corporation website and Customer service are also accessible.



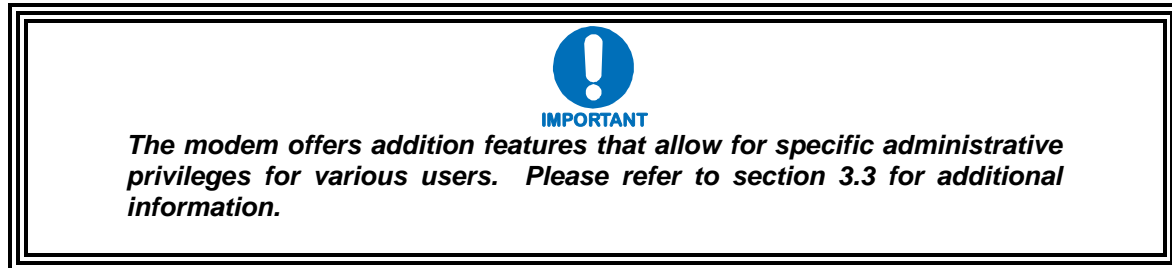
**Figure 3. Web Browser - Modem Introduction page**

11. To navigate other parts of the site, the modem needs to know who the user is. Upon selecting any of the commands, the modem will request an authentication from the user. This authentication is done through the use of a username and secret password. The OM-20 is initially configured with the following defaults as illustrated in Figure 4.

User Name:        admin  
Password:        admin



**Figure 4. Password Setup Screen**



This concludes the initial set up that will allow the user full access to the modem. In the event that the user needs to change the IP Addressing to support a different network then proceed to section 3.1.

---

## D.4 IP Network Change from the Initial Web Setup

### D.4.1 Configuring the modem

This section is a continuation from the initial setup or can be used on an existing system that requires a network setup change. The modem needs to be configured with the correct network settings. Please consult with your IT manager for an IP address mask, and modem, server, and router IP addresses valid for your network. To recognize a subnet, each system in the subnet must have the same subnet mask. This field should be set before changes are made to the Modem or Router Address. Refer to Figure 5.

1. Configure the modem first with the new subnet addresses. From the modem introduction page, click the IP ADMINISTRATION tab located on the top of the screen.
2. Enter your username and password on the logon popup, and then press the Enter key.
3. Change the Boot Mode to NON-VOL. Change IP addresses, and subnet mask to the recommended settings and click on the Save button to accept the changes (refer to section 3.2.2 for Boot Mode descriptions).

**NOTE: NON-VOL:** Stores and uses IP Mask and addresses as provided by the user.

4. Click on the Cancel button at any time to abort and reload the current modem IP network settings.

OM20 Outdoor Modem Sign Out

[Introduction](#) [Password Setup](#) [IP Administration](#) [Monitor & Control](#)

IP Administration / Modem Addressing **RADYNE**

**Modem Addressing**

[Sign Out](#)  
**Hello admin**  
These instructions will show you how to configure the IMT. Click **Save** when you're done.

**Please Note:** Depending on which configuration settings are modified, there might be a communication loss with the unit. If the unit still resides on the same subnet as the host computer and unit is reachable, you just need to close this session then reconnect using your browser. If on the otherhand the unit is on a different network, then follow these instructions to [reconfigure](#) your computer. Once the computer network settings are modified, a restart is necessary to complete the configuration.

Server Boot Mode:	NON-VOL
IP Address Mask:	255.000.000.000
Modem IP Address:	010.000.000.001
Server IP Address:	010.001.001.001
Router IP Address:	010.000.001.001

[Save](#) [Cancel](#)

[Technical Specifications](#) [Product Options](#) [Troubleshooting](#) [About Us](#) [Contact Us](#) ©2006 Radyne Corporation

**Figure 5. Modem Addressing Screen**

## D.4.2 Configuring the Computer

This section is a continuation from the initial setup or can be used on an existing system that requires a network setup change. The computer needs to be configured with the correct network settings that were used for the Modem. Please consult with your IT manager for an IP address mask, and modem, server, and router IP addresses valid for your network. To recognize a subnet, each system in the subnet must

have the same subnet mask. This field should be set after the changes are made to the Modem. Refer to Figure 6.

1. Configure the computer with the new subnet addresses.
2. Initiate PING test to ensure there is communication between the modem and the computer

Example: ping 192.168.0.238

If everything is functioning correctly, replies from the modem will appear on the computer screen along with the time it took to respond. If unsuccessful, verify the following:

- a. The cables are secured.
  - b. The Link Light is illuminated.
  - c. The IP Address that is used matches the Modem's IP Address.
  - d. The Server and Modem are on the same subnet.
3. Start the Internet browser on the computer and enter the new IP Address assigned by the network administrator. Enter the new address field then press the Enter key. Reference Figure 2

---

## D.5 WEB Users Setup and Configurations Controls Options

We use authentication and authorization together with a user database and a Security Realm to design a secure site. This makes use of users and groups, where users are generally people that may access the system, and groups represent the position that users can hold.

The web user database consists of three users, with initial default names of guest, oper, and admin. Access rights and authentication make it possible to restrict/control access to a specified set of web users. Any of the three user names can be modified. The user name can have up to 14 characters supporting alpha and numeric characters. Alpha characters can be entered using the up and down arrow keys. Numeric characters can be selected by using the number keys.

Web User	Authentication Password	Access Group
guest	guest	GUEST
oper	oper	OPER
admin	admin	ADMIN

Some of those selections are also available to a properly authenticated user with ADMIN privileges. Refer to Figure 6.

1. From the modem introduction page, click the ADMINISTRATION tab.
2. If not already logged on, enter your username and password on the logon popup, and then press the Enter key.

3. Select USER1, USER2, or USER3 from the drop down Edit User menu. The corresponding username and access rights will get updated on the screen.
4. Select a new username if desired, and password. Confirm the new password then click on the Save button.
5. Click on the Cancel button at any time to abort and reload the current user settings.

OM20 Outdoor Modem

Introduction | Password Setup | IP Administration | Monitor & Control

Password Setup / Access

**Access**

Sign Out  
Hello admin  
Select user, then choose new password. Click **Save** when you're done.

**Please Note:** To better protect user accounts, please make sure passwords are memorable. Do not share passwords, and never use the same passwords that have been used in the past. For security purposes, passwords should be a minimum of five characters long. A strong password contains a combination of uppercase and lowercase letters, numbers, and special characters.

Edit User: USER1  
User Access Group: GUEST  
Enter User Name: guest  
Enter a New Password:  
Confirm New Password:

Save Cancel

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**Figure 6. User Settings/Access Screen**

ACCESS rights represent the following:

**GUEST:** Users are able to navigate most of the site, and view modem parameter settings.

**OPER:** Users can monitor and control modem parameter settings, and change their own authentication passwords.

**ADMIN:** At this highest access right, the users can monitor and control the modems parameters, change any user's name and authentication password, and modify IP network settings. Admin setting allows access to the entire site.



## NOTE

*User passwords must be memorable, never shared, and never reused. For better security, passwords should be a minimum of 5 printable characters long.*

### D.5.1 Change Authentication Password

The user can modify the Authorization Passwords. The user name can have up to 14 characters supporting alpha and numeric characters. Alpha characters can be entered using the up and down arrow keys. Numeric characters can be selected by using the number keys on the front panel. The user can clear all characters from the front panel screen.

### D.5.2 Boot Mode Options (Reference only)

Boot Modes selections are based on the networks requirements needed for setting up the Web browser. Refer to the manual for more specific details.

Boot Mode options are:

**DEFAULT:** During initialization (boot up), the modem will restore the web setting to the standard IP Mask and addresses supplied by the modem. The modem will be taken off the network and will not be accessible. The Default settings are:

IP Address Mask:	255.000.000.000	(FF.00.00.00 hex)
Modem IP Address:	010.000.000.001	(C0.A8.00.EE hex)
Server IP Address:	010.001.001.001	(0A.01.01.01 hex)
Router IP Address:	010.000.001.001	(0A.00.01.01 hex)

**BOOTP:** During initialization (boot up), the modem will get the names, masks, and IP Addresses of the modem, router, and server.

**NON-VOL:** Stores and uses IP Mask and addresses as provided by the user.

**IP TEST:** Stores and uses IP Mask and addresses to fixed settings as listed below.

Bootp Server Tag:	206	
IP Address Mask:	255.255.255.000	(FF.FF.FF.00 hex)
Modem IP Address:	192.168.0.238	(C0.A8.00.EE)
Server IP Address:	192.168.000.101	(C0.A8.00.65)
Router IP Address:	192.168.000.102	(C0.A8.00.66)

# Appendix E.Drop & Insert (D&I)

## E.1 Drop and Insert (D&I)

(For Efficient Drop & Insert refer to Appendix F)

The Radyne OM20 Drop and Insert (D&I) Function provides an interface between a full T1 or E1 Trunk whose framing is specified in CCITT G.704 and a fractional Nx64 Kbps Satellite Channel that conforms to the IBS and small IDR Framing Structures. The Drop function allows the user to select the terrestrial T1 or E1 timeslots that are to be dropped off for transmission over the link in the specified satellite channels. The Insert function allows the user to select the T1 or E1 timeslots into which the received satellite channels are to be inserted. The two functions are completely independent allowing maximum flexibility in choosing configurations.

The Transmit Data Trunk is brought into the modem via the Drop Data In (DDI) SD Port J10. From there, the TX Baseband Processor extracts the selected timeslots from the G.704 Frame and prepares them for transmission. The Receive Data Trunk is looped internally to the OM20 by a connection between the Drop Data Out (DDO) to the Insert Data In (IDI). The data is buffered inside the modem and the RX Baseband Processor inserts satellite data into the selected timeslots in the G.704 Frame. The modified terrestrial trunk is then output via the Insert Data Out (IDO) RD Port J11. The OM20 is not capable of daisy chaining two units together as all loop timing is done internally to the OM20.

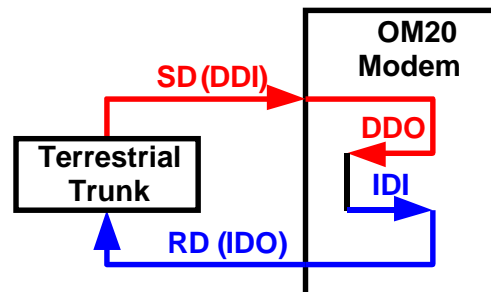


Figure 3-8. OM20 D&I Configuration

## E.2 Drop Only

When Drop is enabled and Insert is disabled, the OM20 performs a drop-only function. Framed E1 or T1 Data is input via the Send Data In Port, the selected timeslots are dropped into the IBS frame structure. (Refer to Figure 3-9).

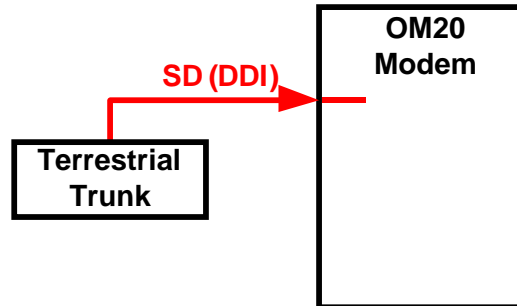


Figure 3-9. Drop Only

## E.3 Insert Only

When Insert is enabled and Drop is disabled, the OM20 performs an insert-only function. If framed terrestrial E1 or T1 Data is available, it should be input via the Drop Data In Port J10. The internal looping function allows for the data stream to be internally looped with the Terrestrial Data buffered inside the Modem. In this mode the modulator should be disabled. The RX Baseband Processor inserts satellite data into the selected timeslots in the looped G.704 Frame and the modified terrestrial data is then output via the Insert Data Out Port J11 (refer to Figure 3-10).

If framed terrestrial data is not available, selection of the Internal T1/E1 frame source will cause the modem to generate the required G.704 Frame. The Satellite Data will be inserted into the selected timeslots, and the resulting terrestrial data will be output via the Insert Data Out Port J11. Any non-inserted timeslots in the G.704 Frame will be filled with the appropriate Idle Code (Refer to Figure 3-11).

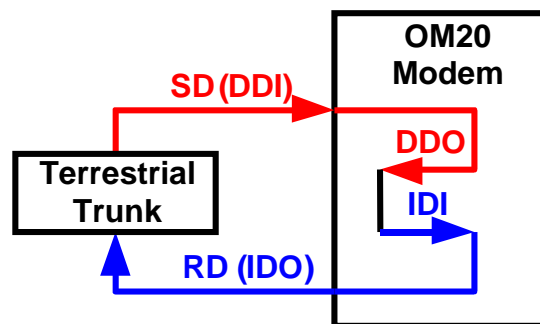


Figure 3-10. Insert Only with Eternal Frame Source



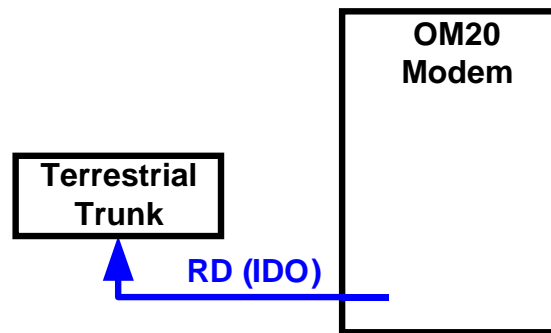


Figure 3-11. Insert Only with Internal Frame Source

## E.4 Mode Selection

The OM20 D&I can be easily configured to support several commonly used terrestrial data formats. For E1 Data, the user can choose between PCM-30, PCM-30C, PCM-31 and PCM-31C. For T1 Data, the user can choose between T1-D4, T1-ESF, and SLC-96. The following paragraphs provide more information on the various mode selection capabilities of the OM20.

### E.4.1 PCM-30

The PCM-30 Mode of Operation supports an E1 Interface with Multiframe Alignment (MFAS) and Channel Associated Signaling (CAS). The user may independently program  $n$  timeslots to drop and  $n$  timeslots to insert where  $n = 1, 2, 3, 4, 5, 6, 8, 10, 12, 15, 16, 20, 24, \text{ or } 30$ . In addition to the selected drop timeslots, the Transmit Function also extracts the appropriate ABCD signaling bits from terrestrial timeslot 16 for transmission in IBS Frame as required. Conversely, the Receive Function extracts received ABCD signaling bits from the IBS Frame and inserts them in timeslot 16 of the appropriate terrestrial frame. This transmission and reception of ABCD signaling based upon the drop and insert timeslots is performed automatically and is transparent to the user. In PCM-30 mode, the user may *not* select timeslot 16 as a Drop or Insert Timeslot.

### E.4.2 PCM-30C

The PCM-30C Mode of Operation supports an E1 Interface with Multiframe Alignment (MFAS) and Channel Associated Signaling (CAS). In addition, the Drop function verifies the received terrestrial CRC checksum and the Insert function calculates the required CRC checksum. The user may independently program  $n$  timeslots to drop and  $n$  timeslots to insert where  $n = 1, 2, 3, 4, 5, 6, 8, 10, 12, 15, 16, 20, 24, \text{ or } 30$ . In addition to the selected Drop timeslots, the Transmit Function also extracts the appropriate ABCD signaling bits from terrestrial timeslot 16 for transmission in IBS Frame as required. Conversely, the Receive Function extracts received ABCD signaling bits from the IBS frame and inserts them in timeslot 16 of the appropriate terrestrial frame. This transmission and reception of ABCD signaling based upon the Drop and Insert timeslots is performed automatically and is transparent to the user. In PCM-30C Mode, the user may not select timeslot 16 as a Drop or Insert Timeslot.

### **E.4.3 PCM-31**

The PCM-31 Mode of Operation supports an E1 Interface with no Multiframe Alignment (MFAS) or Channel Associated Signaling (CAS). The user may independently program  $n$  timeslots to drop and  $n$  timeslots to insert where  $n = 1, 2, 3, 4, 5, 6, 8, 10, 12, 15, 16, 20, 24$ , or 30. Because there is no implied ABCD signaling, the user is free to select timeslot 16 as a Drop *or* Insert Timeslot.

### **E.4.4 PCM-31C**

The PCM-31C Mode of Operation supports an E1 Interface with no Multiframe Alignment (MFAS) or Channel Associated Signaling (CAS). In addition, the Drop Function verifies the received terrestrial CRC checksum and the Insert Function calculates the required CRC checksum. The user may independently program ' $n$ ' timeslots to drop and ' $n$ ' timeslots to insert where ' $n$ ' = 1, 2, 3, 4, 5, 6, 8, 10, 12, 15, 16, 20, 24, or 30. Because there is no implied ABCD signaling, the user is free to select timeslot 16 as a Drop *or* Insert Timeslot.

### **E.4.5 T1-D4/T1-D4-S**

The T1-D4 Mode of Operation supports a T1 Interface with 12 frames per multiframe. The user may independently program  $n$  timeslots to drop and  $n$  timeslots to insert where  $n = 1, 2, 3, 4, 5, 6, 8, 10, 12, 15, 16, 20, 24$ , or 30. In the DMD20, Robbed Bit Signaling (RBS) is handled without any need for operator intervention and is transparent to the user.

### **E.4.6 T1-ESF/T1-ESF-S**

The T1-ESF Mode of Operation supports a T1 Interface with 24 frames per multiframe. The CRC-6 checksum is automatically checked by the Drop Function and generated by the Insert Function and placed in the appropriate F-bit positions in the terrestrial multiframe. The user may independently program  $n$  timeslots to drop, and  $n$  timeslots to insert, where  $n = 1, 2, 3, 4, 5, 6, 8, 10, 12, 15, 16, 20, 24$ , or 30. In the OM20, Robbed Bit Signaling (RBS) is handled without any need for operator intervention and is transparent to the user.

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## **E.5 Multidestinational Systems**

Because the Drop and Insert Functions are completely independent, the OM20 easily supports multidestinational communications. Figure 3-12 illustrates a Multidestinational System with one Hub site and three remote sites. At the Hub site, thirty channels are being transmitted to all three remote sites and a fractional set of channels is being received from each remote site. At the other end of the link, each remote site is transmitting a fractional E1 to the Hub site as well as receiving all 30 channels from the Hub site. It also identifies those channels intended for it, and inserts them into the terrestrial data stream.

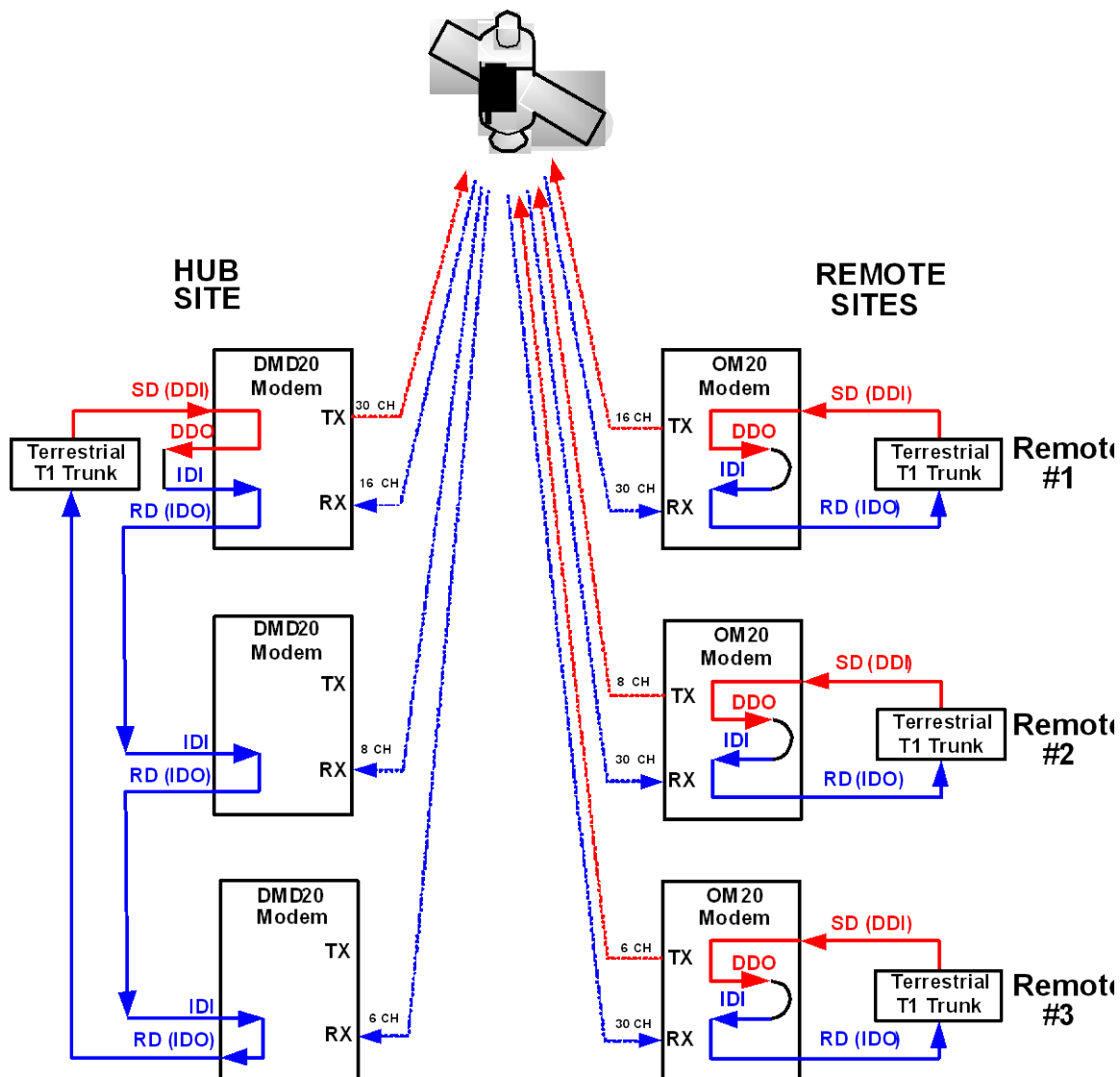


Figure E-1. Multidestinational Communications

## E.6 Drop and Insert Mapping

The following displays under Interface D&I Setup (both Tx and Rx), are editing displays only:

**SATCh TS**  
**Enter to Edit**

Any changes made in these displays are made on the screen, but are not entered into the modem. Once these menus are configured, the Mapping Menu must be used to actually enter the settings into the modem.

## Assigning Time Slots:

### Example :

For a modem w/ Drop & Insert enabled at a data rate of 256kb (with timeslots assigned 1 - 1, 2 - 2, etc.). At a data rate of 256kb, the modem will allow 4 channels to assign timeslots (Nx64kb). Under the Interface Menu the Tx or Rx Interface can be configured (refer to Figure 3-13). Use these menus to set up the interface and then point and click the cursor on the channel time slot to be changed. When finished changing the time slots press the “Submit Map” gel tab. Repeat these steps for the Rx Interface configuration. Assign the timeslots that are to be used to the 4 channels. CH1 is assigned to TS1 (Timeslot #1), CH2 to TS 2, CH3 to TS3 and CH4 to TS4, “Submit Map” must be depressed after assigning Time Slots.

Hello "admin" Introduction | Password Setup | IP Administration | Sign Out

**OM20 Outdoor Modem**

MOD: TRANSMIT ON, TEST MODE, MAJOR ALARM, MINOR ALARM  
 DEMOD: SIGNAL LOCK, TEST MODE, MAJOR ALARM, MINOR ALARM  
 EVENT: FAULT, REMOTE, POWER

TRANSMIT RECEIVE **INTERFACE** MONITOR ALARMS SYSTEM TEST

TX SETUP RX SETUP GENERAL

INTERFACE / TX SETUP

Circuit Id:   
 Terr. Clock Source: SCT  
 Sct Clock Source: INTERNAL  
 Esc Ch. 1 Gain: 5.0  
 Eth Flow Control: DISABLED  
 Eth QOS Type: NORMAL

Terrestrial Interface: V.35  
 Tx Clock Polarity: NORMAL  
 Sct Clock Polarity: NORMAL  
 Esc Ch. 2 Gain: 7.0  
 Eth Daisy Chain: DISABLED  
 Eth QOS Queue: FAIR WEIGHTED

ASYNC  
 Async Mode: ES-ES  
 ES Baud Rate: 4800  
 ES Interface: RS-232  
 ES Bits/Char: 7

Drop Map  
 Drop Mode: NONE Submit Map Reset Map

Sat Channel:	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Terr TSLOT:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30

**Figure E-2 Tx Interface Configuration**



***It is not mandatory to assign timeslots in sequential order, although the lowest timeslot must be entered in the lowest channel. For example: timeslots may be assigned 1 - 2, 2 - 5, etc. but not 1 - 5, 2 - 2.***

## E.7 Configuring the OM20 for Drop and Insert

Several dependencies exist when configuring the modem for Drop and Insert (D&I). The following paragraphs explain these dependencies and provide the user with the information required to ensure smooth transition into D&I and to minimize the potential impact of these dependencies.

### E.7.1 Data Rate

Data Rate affects the Drop and Insert function in the following ways:

- It determines the number of Satellite Channels that will be displayed in the Edit Maps.
- It contributes to the Operational Mode selection process. Trying to change the Operational Mode to D&I when a data rate is not set to a valid D&I rate will result in the error message 'INVALID DATA RATE,' and the mode change will not be allowed.
- It contributes to the Terrestrial Framing Mode selection process. Trying to select a T1-type Drop Mode such as T1-ESF with the mod data rate set to 1920000 bps (a valid E1 D&I rate but not a valid T1 rate) will result in the error message 'INVALID DROP MODE' and the selection will not be allowed. Trying to select a T1 type Insert Mode such as T1-D4 with the demod data rate set to 1920000 bps will result in the error message INVALID INSERT MODE and the selection will not be allowed.
- Once D&I Mode has been selected, trying to change the data rate to something other than another valid D&I data rate will result in the error message 'RATE OUT OF BOUNDS' and the change will not be allowed.
- Once D&I Mode has been selected with a T1 Terrestrial Framing Mode, attempting to change the data rate to 1920000 will result in the error message 'RATE OUT OF BOUNDS' and the change will not be allowed.

Therefore, after the interface type, the data rate should be entered as the first step in configuring the modem for D&I. The Mod Data Rate should be set according to the number of timeslots to be dropped and the Demod Data Rate should be set according to the number of timeslots to be inserted. The following table gives the allowable D&I data rates based on the number of slots (n) to be dropped or inserted.

n = 1, data rate = 64000  
n = 2, data rate = 128000  
n = 3, data rate = 192000  
n = 4, data rate = 256000  
n = 5, data rate = 320000  
n = 6, data rate = 384000  
n = 8, data rate = 512000  
n = 10, data rate = 640000  
n = 12, data rate = 768000  
n = 15, data rate = 960000  
n = 16, data rate = 1024000  
n = 20, data rate = 1280000  
n = 24, data rate = 1536000  
n = 30, data rate = 1920000 (valid with E1 Interface only)

## E.7.2 Operational Network Specification

The Network Specification of the Modem often determines which additional menus and displays are available for use by the operator. The D&I Mode-specific menus will not be displayed unless the Network Spec. of the modem is set to D&I. Therefore, the next step in configuring the modem should be to set the Network Spec. to D&I. At this point, the D&I specific menus in the Interface section will become available and will remain available until the Network Spec. of the modem is changed to something other than D&I. When the Network Spec. is changed to something other than D&I, the D&I specific menus will automatically disappear.

## E.7.3 Terrestrial Framing - Drop Mode/Insert Mode

The Drop Mode Selection and the Insert Mode Selection identify the Terrestrial Data-Framing Format. As previously mentioned, their selection is influenced by the Modulator and Demodulator Data Rates, and trying to select a T1 Type Framing Format with a data rate of 1920000 bps will result in an error message. In turn, the selection of the terrestrial framing formats influences the satellite channel to terrestrial timeslot mappings in the following manner:

The selection of T1-D4, T1-ESF, or SLC-96 type terrestrial framing format limits the terrestrial timeslots to values from 1 - 24.

The selection of PCM-30 or PCM-30C type terrestrial framing limits the terrestrial timeslots to values from 1 - 15, 17 - 31. In these modes, terrestrial timeslot 16 is reserved for ABCD signaling and may not be dropped or inserted.

The selection of PCM-31 or PCM-31C type terrestrial framing limits the terrestrial timeslots to values from 1 - 31. Therefore, the terrestrial framing format should be identified via the Drop Mode and Insert Mode entries prior to editing the Drop or Insert satellite channel to terrestrial timeslot maps.

### E.7.3.1 Insert Terrestrial Frame Source

The Insert Terrestrial Frame Source selection tells the Modem from where the Insert Terrestrial Frame is coming.

**External:** Indicates that the terrestrial frame is to be input via the Insert Data In Port (Internally looped to the DDO Port).

**Internal:** Indicates that the modem needs to generate the terrestrial frame and that all non-inserted timeslots need to be filled with the appropriate idle code based upon the terrestrial framing (T1 or E1).

The selection of the Insert Terrestrial Frame Source also influences the Buffer Clock selection in the following manner:

When the Insert Terrestrial Frame Source selection is set to External, the received satellite data will be clocked out of the Doppler Buffer based upon the clock recovered from the insert data input. Therefore, the Buffer Clock selection will automatically be set to External and cannot be modified. Attempts to select a different buffer clock will result in the error message INVALID BUFFER CLOCK and the selection will not be allowed.

When the Insert Terrestrial Frame Source selection is set to Internal, the operator needs to specify how data should be clocked out of the Doppler Buffer. In this case, the operator will be able to select SCTE, SCT, RX SAT, or EXT EXC as the source for the Buffer Clock.

Therefore, the Insert Terrestrial Frame Source selection should be made prior to attempting to change the Buffer Clock. In most instances, the Insert Terrestrial Frame Source selection will be set to External and the Buffer Clock will automatically be set to External.

### E.7.4 D&I Sample Configurations and D&I Clock Setup Options

The following are several examples of how to configure the modem for D&I. The OM20's DDO and IDI are internally looped

**Example 1:** Drop 512 Kbps from a T1 trunk, 3/4 Rate Viterbi  
Insert 512 Kbps into a T1 trunk, 3/4 Rate Viterbi  
Drop 512 Kbps from a T1 trunk, 3/4 Rate Viterbi

Under Interface:

Under TX Setup

Set Tx Type according to your hardware configuration  
(example: G703BT1B8ZS)

Under RX Setup

Set Rx Type according to your hardware configuration

Under Modulator:

Under Mod Data:

Set Data Rate = 512000

Set Conv Enc = 3/4 Rate VIT

Set Network Spec. = Drop & Insert

Under Interface:

Under TX Setup:

Set Tx Clock = SCTE

Under Tx D&I:

Set Drop Mode = T1-D4

Use SATCh TS edit capability to define desired mapping of  
Satellite Channels to drop Terrestrial Slots

Use Map Copy to copy Tx Edit to Tx Active

Under Modulator:

Under Mod IF:

Set Frequency to desired value

Turn IF Output Power On

Under Demodulator:

Under Demod Data:

Set Data Rate = 512000

Set Conv Enc = 3/4 Rate VIT

Under Demodulator:

Set Network Spec. = Drop & Insert

Under Interface:

Under RX Setup:

Set Buff Size to desired depth

Under Rx D&I:

Set Insert Mode = T1-D4

Set T1 E1 Frm Src = External

Use SATCh TS edit capability to define proper mapping of

Satellite Channels to insert Terrestrial Slots

Use Map Copy to copy Rx Edit to Rx Active

Under Demodulator:

Under Demod IF:

Set Frequency to desired value

**Example 2:** Multidestinational Remote Site Programming

Drop 512 Kbps from a T1 trunk, 3/4 Rate Viterbi.

Extract 512 Kbps from a 1536 Kbps carrier and insert into a  
T1 trunk, 3/4 Rate Viterbi.

Drop 512 Kbps from a T1 trunk, 3/4 Rate Viterbi

Configuration setup is exactly as previously shown in Example 1.

Extract 512 Kbps from a 1536 Kbps carrier and insert into a T1 trunk, 3/4 Rate Viterbi

Under Interface:

Under RX Setup:

Set Rx Type according to your hardware configuration



Under Demodulator:

Under Demod Data:

Set Data Rate = 1536000

Set Conv Enc = 3/4 Rate VIT

Under Demodulator:

Set Network Spec. = Drop & Insert

Under Interface:

Under RX Setup:

Set Buff Size to desired depth

Under Rx D&I:

Set Insert Mode = T1-D4

Set T1 E1 Frm Src = External

Use SATCh TS edit capability to define proper mapping of Satellite Channels to  
insert Terrestrial Slots

For Satellite Channels that are not to be inserted, enter “NI” (No Insert) for the  
Terrestrial Slot

Use Map Copy to copy Rx Edit to Rx Active

Under Demodulator:

Under Demod IF:

Set Frequency to desired value.

## E.8 D&I Maps and Map Editing

The Drop and Insert multiplexer is programmed by loading it with a transmit and receive map. Maps always contain 30 entries, although, only the first “n” entries are relevant (see Table 4-10).

The OM20 includes provisions to copy, change, and store the D&I transmit and receive maps directly from the Front Panel or via the remote M&C link. These maps are tables that are used to define and configure the D&I functions. Each map contains up to 30 entries, which are enough to define the channel assignments for a T1 (24 channel) or E1 (30 channel) frame structure.

Maps that are created are stored in non-volatile memory within the modem and remain unchanged after a power-down.

<b>Table E-1. D&amp;I Multiplexer Map Locations Used</b>	
<b>Data Rate (Kbps)</b>	<b>Map Locations Used (n = 1, 2,4,8,16,24,30)</b>
64	1
128	1-2
256	1-4
384	1-6
512	1-8
768	1-12
1024	1-16
1536	1-24
1920	1-30

It is important to understand that each map contains up to 30 usable entries. In many cases a smaller number of entries will be relevant. To determine the number of relevant entries, divide the data rate by 64 Kbps.

**For example:**

At 384 Kbps,  $384/64 = 6$  entries.

Therefore, in this case only the first six entries of the map would be relevant.

The Modem is equipped with eight permanently stored default maps, which are designated ROM 1 through ROM 8. The user may also define, modify, and save an additional eight maps which are designated USER 1 through USER 8.

**NOTE**

*ROM maps are read-only and may not be modified (refer to Table E-2).*

**Table E-2. D&I ROM Maps**

ROM Map	T1/E1 Time Slot																															
	#	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
3	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
4	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2
5	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
6	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8
7	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
8	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33

Since the D&I Functions are separate and distinct, two separate maps must be configured at the start of the D&I Multiplexer Operation. These are the Tx (transmit) Active Map for Drop Mapping and the Rx (receive) Active Map for Insert Mapping. Each map entry consists of an IBS Time Slot assignment and the Terrestrial (T1 or E1) Channel Number to which it is assigned. Drop Mapping and Insert Mapping are completely separate and independent.

The map that is actually used for the Drop Function is the Tx Active Map; the map that is actually used for the Insert function is the Rx Active Map. Two additional maps exist: the Tx Edit Map and the Rx Edit Map. The Edit Maps are the buffer areas that are used when creating or modifying a map through the modem's LCD; when editing is complete, the appropriate map should be copied to the Active Map.

Any map may be copied to any other map with the exception of the ROM maps. These maps may only be the source of the data used to create a User, Edit, or Active Map.

Maps can be created in the map editor and stored as "User Maps". New "Active Maps" can be downloaded during Modem Operation but this will result in a temporary disruption of service on the terrestrial line or the Satellite transmission.

The following paragraphs give examples of typical configurations that could use the ROM Maps as templates. The ROM Map used would have to be first copied to the appropriate Active Transmit (Drop) and/or Active Receive (Insert) Map(s) before it could be used. To use a modification of a ROM Map, the ROM Map must first be copied to the appropriate Edit Map, then modified, and then copied to the appropriate Active Map.



***The mapping of channels to time slots is arbitrary; it is not necessary to map CH1 to TS1, CH2 to TS2, etc. The channel to the time slot mapping may be in any order within the constraints of the number of available channels.***

For example, ROM Map 1 could be used as the template for as Active Transmit (Drop) Map for a modulator configured for 64 Kbps operation. Only the first time slot of the T1 or E1 frame would be dropped into the modulator transmit path. The Drop Multiplexer would know to look only at the first entry in the Active Transmit table and would ignore the other 29 entries. If the map contained an “8” in its first entry, the eighth channel of the T1/E1 frame would be sent to the modulator.

ROM Map 2 could be used as the template for an Active Receive (Insert) Map for a demodulator configured for 128 Kbps operation. The demodulated data in the receive path would be inserted into the first two time slots of the T1 or E1 frame. The Insert Multiplexer would know to look only at the first two entries in the Active Receive table and would ignore the other 28 entries. If the first two entries were modified to contain a 27 and 28, the data would be inserted into the 27<sup>th</sup> and 28<sup>th</sup> time slots of the E1 frame.

ROM Map 3 could be used as the template for an Active Transmit (Drop) Map with a modulator and/or demodulator configured for 256 Kbps operation. The T1 or E1 Data in the transmit path or the demodulated data in the receive path would be dropped from and/or inserted into the first four time slots of the T1 or E1 frame. The Multiplexer would know to look only at the first four entries in the Active map(s) and would ignore the other 26 entries.

ROM Map 4 could be used as the template for an Active Transmit (Drop) or Active Receive (Insert) Map with a modulator and/or demodulator configured for 384 Kbps operation. The T1 or E1 Data in the transmit path or the demodulated data in the receive path would be dropped from and/or inserted into the first six time slots of the T1 or E1 frame. The Insert Multiplexer would know to look only at the first six entries in the Active map(s) and would ignore the other 24 entries. To Drop the last six channels of a T1 frame into a modulator transmit path, the first six entries of the Active Transmit map should contain 19, 20, 21, 22, 23, and 24.

ROM Map 5 could be used as the template for an Active Transmit (Drop) and/or Active Receive (Insert) Map with a modulator and/or demodulator configured for 512 Kbps operation. The T1 or E1 Data in the transmit path or the demodulated data in the receive path would be dropped

from and or inserted into the first eight time slots of the T1 or E1 frame. The Multiplexer would know to look only at the first eight entries in the Active map(s) and would ignore the other 22 entries. To insert data received from a demodulator into channels 17 through 24 of an E1 frame, the first eight entries of the Active Receive map should contain 17, 18, 19, 20, 21, 22, 23, and 24.

ROM Map 6 could be used as the template for an Active Transmit (Drop) and/or Active Receive (Insert) Map with a modulator and/or demodulator configured for 768 Kbps operation. The T1 or E1 Data in the transmit path or the demodulated data in the receive path would be dropped from and or inserted into the first 12 time slots of the T1 or E1 frame. The Multiplexer would know to look only at the first 12 entries in the Active map(s) and would ignore the other 18 entries. To insert data received from a demodulator into channels 3 through 14 of an E1 frame, the first 12 entries of the Active Receive map should contain 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, and 14.

ROM Map 7 could be used as the template for an Active Transmit (Drop) and/or Active Receive (Insert) Map with a modulator and/or demodulator configured for 1920 Kbps operation. This would be used with E1 frames where time slot 16 is not used for the multiframe alignment signal and therefore channels 1 through 30 are mapped directly with time slots 1 through 30.

ROM Map 7 could also be used as the template for an Active Transmit (Drop) and/or Active Receive (Insert) Map with a modulator and/or demodulator configured for 1024 Kbps operation. This would be used with T1 or E1 frames where channels 1 through 16 are mapped into time slots 1 through 16 (in any order). Map slots 17 through 30 would be ignored.

ROM Map 7 could also be used as the template for an Active Transmit (Drop) and/or Active Receive (Insert) Map with a modulator and/or demodulator configured for 1536 Kbps operation. This would be used with T1 frames where channels 1 through 24 are mapped into time slots 1 through 24 (in any order). Map slots 25 through 30 would be ignored.

ROM Map 8 could also be used as the template for an Active Transmit (Drop) and/or Active Receive (Insert) Map with a modulator and/or demodulator configured for 1920 Kbps operation. However, this mapping would be relevant with E1 frames where time slot 16 is used for the multiframe alignment signal and therefore channels 1 through 30 are mapped to time slots 1 through 16 and 17 through 31.

**Notes:**

[illegible]

# Appendix F. Efficient Drop & Insert (D&I)

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## F.1 Introduction

The following paragraphs describe the menu structure and procedure for configuring a Radyne OM20 modem for Efficient Drop & Insert Mode.

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## F.2 Prerequisite

In order for a modem to be configured for efficient Drop & Insert, the modem must have a G.703 Interface card installed and Open Network Drop & Insert must be enabled. If your modem does not have the required hardware and/or feature set enabled, you will need to contact your Radyne salesperson to order the appropriate hardware and/or feature set upgrade. If your modem has the appropriate hardware, but the software revision is prior to AY, you will need to download the latest modem firmware from the Radyne FTP website.

The following menus illustrate how to determine whether or not your modem has the required hardware and feature set options.

SYSTEM  
HW/FW CONFIG  
FIRMWARE  
F05058-AY 6.1 or later required

SYSTEM  
HW/FW CONFIG  
TERR INTFC BRD  
01-AS/4975 or equivalent required

SYSTEM  
HW/FW CONFIG

FEATURES	
UPGRADE LIST	
D&I	
INSTALLED	required
ENH ASYNC	
INSTALLED	optional, required if desired
AUPC	
INSTALLED	optional, required if desired

### F.3 Efficient Drop & Insert Mode

With Efficient Drop & Insert, the terrestrial interface selections, terrestrial framing modes, terrestrial to satellite mapping, ES to ES channel, satellite and terrestrial backward alarm functionality, and the In Station Prompt and Deferred Service alarm operation are identical to that of the Open Network standard. In addition, the selection and operation of Enhanced Async and AUPC are identical to their closed network IBS counterparts. For more information on these selections, refer to the appropriate section of the User's manual.

The following menu selections are utilized for controlling the additional functionality available with efficient Drop and Insert:

#### MODULATOR or DEMODULATOR

##### NETWORK SPEC

CLOSED NET      Efficient Drop & Insert is a Closed Network selection

##### SAT FRAMING

EFFICIENT D&I      The satellite frame type is Efficient Drop & Insert

##### DATA

##### DATA RATE (bps)

N x 64000      The data rate can be set to any N x 64 kbps rate based on the desired number of drop or insert slots. The following values of N are allowed based on the terrestrial interface and terrestrial framing types shown

T1	Any framing	Any N from 1 to 24
E1	Any PCM31	Any N from 1 to 31
E1	Any PCM30	Any N from 1 to 30 as TS 16 is automatically transmitted

##### SCRAMBLER CTRL

DISABLED      The Efficient Drop & Insert mode utilizes a frame synchronous energy dispersal technique that is always on, thus there is no need for any additional scrambling



**INBAND RATE**

150	Available when enhanced async is enabled, this field
300	allows the operator to set the Earth Station to Earth
600	station in-band rate. In most cases, this should be set to the
1200	same rate or higher than the ES port baud rate. When this
2400	rate is set lower than the ES port baud rate, the user must
4800	insure that the actual transmission rate does not exceed the
9600	in-band rate, otherwise, characters will be dropped
19200	

**F.3.1 Calculating the Required Satellite Bandwidth**

In order to calculate the satellite bandwidth (i.e. the symbol rate), we must first calculate the Efficient D&I Rate (i.e. the data rate plus the overhead required for Efficient Drop & Insert). From there, the calculation of the required satellite bandwidth is identical to all other modes of operation and simply takes into account modulation type and forward error correction.

In this section, we will cover the calculation of the basic Efficient D&I Rate, as well as, the two cases that alter the basic rate.

**F.3.2 Calculating the Basic Efficient D&I Rate**

When E1 signaling is not required (all T1 and PCM31 cases) and Enhanced Async is not enabled (the Earth Station to Earth station link is the standard ES-ES), the Efficient D&I Rate for N timeslots is as follows:

$$\text{Efficient D\&I Rate} = \text{Data Rate} + (N * 250 \text{ bps})$$

In other words, the basic Efficient Drop & Insert Rate only requires 250 bps of overhead per slot, while at the same time providing all of the functionality found in the open network standard plus Automatic Uplink Power Control. By comparison, the open network standard requires 4267 bps per slot, so by utilizing Efficient Drop and Insert, Radyne customers can realize a bandwidth savings of over 4000 bps per slot.

**F.3.3 Calculating the Efficient D&I Rate with E1 Signaling**

When E1 signaling is enabled (PCM-30, PCM30C), an additional 2000 bps per slot are required to carry the E1 signaling. So the Efficient D&I Rate for N timeslots is:

$$\text{Efficient D\&I Rate increase} = N * 2000 \text{ bps}$$

With the open network standard requiring 4267 bps per slot, Efficient Drop and Insert provides a bandwidth savings of over 2000 bps per slot when E1 signaling is required.

### F.3.4 Calculating the Efficient D&I Rate with Enhanced Asynchronous Overhead

The amount of overhead required to carry the Enhanced Async is driven by the in-band baud rate. The calculation is a two step process involving the in-band baud rate and the number of slots as follows:

$$X = \text{Truncation of } (\text{In-Band Baud Rate} / (N * 125))$$

$$\text{Efficient D\&I Rate increase} = X * N * 125 \text{ bps}$$

Because of the truncation, this increase in bandwidth is guaranteed to be less than the baud rate itself.

#### Summary and Examples:

The following examples further illustrate how to calculate the Efficient D&I rate which can be summarized for N timeslots as:

$$\text{Efficient D\&I Rate} = \text{Data Rate} + (N * 250 \text{ bps})$$

With E1 signaling add

$$N * 2000 \text{ bps}$$

With Enhanced Async add

$$(\text{Truncation } (\text{In-Band Baud} / (N * 125))) * (N * 125) \text{ bps}$$

#### Example 1a:

5 Drop Slots with T1-D4 framing, standard ES to ES overhead

For 5 Drop Slots, the Data Rate would be  $5 * 64000$  or 320000 bps

The Efficient D&I Rate would be  $320000 + (5 * 250) \text{ bps} = 321250 \text{ bps}$

The Open Network rate is over 20,000 bps higher at 341333 bps.

#### Example 1b:

Change to E1-PCM30 framing (E1 Signaling), standard ES to ES overhead

Add  $5 * 2000 \text{ bps}$  to our previous calculation gives 331250 bps

Still saving over 10,000 bps compared to the open network standard.

**Example 1c:**

Change to Enhanced Async with In-Band Baud Rate of 1200

$$X = \text{Truncation of } (1200 / (5 * 125))$$

$$X = \text{Truncation of } (1.92)$$

$$X = 1$$

Add  $1 * 5 * 125$  bps to our previous calculation gives 331875 bps

An increase of 625 bps to carry 1200 baud

**Example 2a:**

10 Drop Slots with T1-D4 framing, standard ES to ES overhead

For 10 Drop Slots, the Data Rate would be  $10 * 64000$  or 640000 bps

The Efficient D&I Rate would be  $640000 + (10 * 250)$  bps = 642500 bps

The Open Network rate is over 40,000 bps higher at 682667 bps.

**Example 2b:**

Change to E1-PCM30 framing (E1 Signaling), standard ES to ES overhead

Add  $10 * 2000$  bps to our previous calculation gives 662500 bps

Still saving over 20,000 bps compared to the open network standard.

**Example 2c:**

Change to Enhanced Async with In-Band Baud Rate of 1200

$$X = \text{Truncation of } (1200 / (10 * 125))$$

$$X = \text{Truncation of } (0.96)$$

$$X = 0$$

The rate stays at the previous value of 662500

With 10 slots, there is no increase required to carry 1200 baud Enhanced Async. It is passed transparently in the Efficient Drop & Insert overhead.

**Notes:**

[illegible]

# Appendix G. Strap Codes

## G.1 Strap Codes

The Strap Code is a quick set key that sets many of the modem parameters. For quick setup of the modem, Strap Codes are very helpful. When a Strap Code is entered, the modem is automatically configured for the code's corresponding data rate, overhead, code rate, framing, scrambler type and modulation. An example of how to set a strap code follows:

**Example:** At the Front Panel <Modulator> Menu, depress '↓', then move '→' to the 'Strap Code' Submenu and enter #16. The modem will be automatically configured to the parameters shown below in the highlighted row 'Strap Code 16'.

Use the Strap Code Guide (Table G-1) for available strap codes.

Table G-1. Strap Codes										
Dis = Disable										
Strap Code (Decimal)	Data Rate (Kbps)	Overhead	Code Rate	Type	Framing Type	Scrambler Type	Drop and Insert	Reed-Solomon	Modulation	Mode
1	64	16/15	1/2	VIT	IBS	IBS	Dis	Dis	QPSK	IBS
2	128	16/15	1/2	VIT	IBS	IBS	Dis	Dis	QPSK	IBS
3	256	16/15	1/2	VIT	IBS	IBS	Dis	Dis	QPSK	IBS
5	384	16/15	1/2	VIT	IBS	IBS	Dis	Dis	QPSK	IBS
6	512	16/15	1/2	VIT	IBS	IBS	Dis	Dis	QPSK	IBS
9	768	16/15	1/2	VIT	IBS	IBS	Dis	Dis	QPSK	IBS
4	1536	16/15	1/2	VIT	IBS	IBS	Dis	Dis	QPSK	IBS
10	1920	16/15	1/2	VIT	IBS	IBS	Dis	Dis	QPSK	IBS
8	2048	16/15	1/2	VIT	IBS	IBS	Dis	Dis	QPSK	IBS

12	2048	16/15	1/2	VIT	IBS	IBS	Dis	Dis	QPSK	CNT
16	1544	96K	3/4	VIT	IDR	V.35 (IESS)	Dis	Dis	QPSK	IDR
32	2048	96K	3/4	VIT	IDR	V.35 (IESS)	Dis	Dis	QPSK	IDR
64	6312	96K	3/4	VIT	IDR	V.35 (IESS)	Dis	Dis	QPSK	IDR
128	8448	96K	3/4	VIT	IDR	V.35 (IESS)	Dis	Dis	QPSK	IDR
24	56	1	1/2	VIT	NONE	V.35 (IESS)	Dis	Dis	QPSK	CNT
33	56	1	3/4	VIT	NONE	V.35 (IESS)	Dis	Dis	QPSK	CNT
34	64	1	1/2	VIT	NONE	V.35 (IESS)	Dis	Dis	QPSK	CNT
36	64	1	3/4	VIT	NONE	V.35 (IESS)	Dis	Dis	QPSK	CNT
40	128	1	1/2	VIT	NONE	V.35 (IESS)	Dis	Dis	QPSK	CNT
48	128	1	3/4	VIT	NONE	V.35 (IESS)	Dis	Dis	QPSK	CNT
65	256	1	1/2	VIT	NONE	V.35 (IESS)	Dis	Dis	QPSK	CNT
66	256	1	3/4	VIT	NONE	V.35 (IESS)	Dis	Dis	QPSK	CNT
68	320	1	1/2	VIT	NONE	V.35 (IESS)	Dis	Dis	QPSK	CNT
72	320	1	3/4	VIT	NONE	V.35 (IESS)	Dis	Dis	QPSK	CNT
80	384	1	1/2	VIT	NONE	V.35 (IESS)	Dis	Dis	QPSK	CNT
96	384	1	3/4	VIT	NONE	V.35 (IESS)	Dis	Dis	QPSK	CNT
129	512	1	1/2	VIT	NONE	V.35 (IESS)	Dis	Dis	QPSK	CNT
130	512	1	3/4	VIT	NONE	V.35 (IESS)	Dis	Dis	QPSK	CNT
132	768	1	1/2	VIT	NONE	V.35 (IESS)	Dis	Dis	QPSK	CNT
136	768	1	3/4	VIT	NONE	V.35 (IESS)	Dis	Dis	QPSK	CNT
144	896	1	1/2	VIT	NONE	V.35 (IESS)	Dis	Dis	QPSK	CNT
44	896	1	3/4	VIT	NONE	V.35 (IESS)	Dis	Dis	QPSK	CNT
7	1344	1	1/2	VIT	NONE	V.35 (IESS)	Dis	Dis	QPSK	CNT
11	1344	1	3/4	VIT	NONE	V.35 (IESS)	Dis	Dis	QPSK	CNT
13	1536	1	1/2	VIT	NONE	V.35 (IESS)	Dis	Dis	QPSK	CNT
14	1536	1	3/4	VIT	NONE	V.35 (IESS)	Dis	Dis	QPSK	CNT
19	1544	1	1/2	VIT	NONE	V.35 (IESS)	Dis	Dis	QPSK	CNT
21	1544	1	3/4	VIT	NONE	V.35 (IESS)	Dis	Dis	QPSK	CNT
22	1920	1	1/2	VIT	NONE	V.35 (IESS)	Dis	Dis	QPSK	CNT
25	1920	1	3/4	VIT	NONE	V.35 (IESS)	Dis	Dis	QPSK	CNT
26	2048	1	1/2	VIT	NONE	V.35 (IESS)	Dis	Dis	QPSK	CNT
28	2048	1	3/4	VIT	NONE	V.35 (IESS)	Dis	Dis	QPSK	CNT
37	2368	1	1/2	VIT	NONE	V.35 (IESS)	Dis	Dis	QPSK	CNT
38	2368	1	3/4	VIT	NONE	V.35 (IESS)	Dis	Dis	QPSK	CNT
41	48	1	1/2	VIT	NONE	V.35 (IESS)	Dis	Dis	QPSK	CNT
160	1544	965/1024	1/2	VIT	IBS	IBS	Dis	Dis	QPSK	IBS
52	1920	16/15	3/4	VIT	IBS	IBS	Dis	Dis	QPSK	IBS

69	6312	1	3/4	VIT	NONE	V.35 (IESS)	Dis	Dis	QPSK	CNT
70	8448	1	3/4	VIT	NONE	V.35 (IESS)	Dis	Dis	QPSK	CNT
73	3152	1	1/2	VIT	NONE	V.35 (IESS)	Dis	Dis	QPSK	CNT
74	3152	1	3/4	VIT	NONE	V.35 (IESS)	Dis	Dis	QPSK	CNT
76	3264	1	1/2	VIT	NONE	V.35 (IESS)	Dis	Dis	QPSK	CNT
81	3264	1	3/4	VIT	NONE	V.35 (IESS)	Dis	Dis	QPSK	CNT
88	512	16/15	3/4	VIT	IBS	IBS	Dis	Dis	QPSK	IBS
97	1024	1	1/2	VIT	CNT	V.35 (IESS)	Dis	Dis	QPSK	CNT
98	1024	1	3/4	VIT	CNT	V.35 (IESS)	Dis	Dis	QPSK	CNT
112	64	16/15	3/4	VIT	IBS	IBS	Dis	Dis	QPSK	IBS
131	128	16/15	3/4	VIT	IBS	IBS	Dis	Dis	QPSK	IBS
133	256	16/15	3/4	VIT	IBS	IBS	Dis	Dis	QPSK	IBS
134	192	16/15	1/2	VIT	IBS	IBS	Dis	Dis	QPSK	CNT
137	192	16/15	3/4	VIT	IBS	IBS	Dis	Dis	QPSK	CNT
138	320	16/15	1/2	VIT	IBS	IBS	Dis	Dis	QPSK	CNT
140	320	16/15	3/4	VIT	IBS	IBS	Dis	Dis	QPSK	CNT
145	384	16/15	3/4	VIT	IBS	IBS	Dis	Dis	QPSK	IBS
100	448	16/15	1/2	VIT	IBS	IBS	Dis	Dis	QPSK	CNT
146	448	16/15	3/4	VIT	IBS	IBS	Dis	Dis	QPSK	CNT
104	576	16/15	1/2	VIT	IBS	IBS	Dis	Dis	QPSK	CNT
148	576	16/15	3/4	VIT	IBS	IBS	Dis	Dis	QPSK	CNT
152	640	16/15	1/2	VIT	IBS	IBS	Dis	Dis	QPSK	CNT
161	640	16/15	3/4	VIT	IBS	IBS	Dis	Dis	QPSK	CNT
162	704	16/15	1/2	VIT	IBS	IBS	Dis	Dis	QPSK	CNT
164	704	16/15	3/4	VIT	IBS	IBS	Dis	Dis	QPSK	CNT
168	768	16/15	3/4	VIT	IBS	IBS	Dis	Dis	QPSK	IBS
193	832	16/15	1/2	VIT	IBS	IBS	Dis	Dis	QPSK	CNT
194	832	16/15	3/4	VIT	IBS	IBS	Dis	Dis	QPSK	CNT
196	896	16/15	1/2	VIT	IBS	IBS	Dis	Dis	QPSK	CNT
208	896	16/15	3/4	VIT	IBS	IBS	Dis	Dis	QPSK	CNT
224	960	16/15	1/2	VIT	IBS	IBS	Dis	Dis	QPSK	CNT
15	960	16/15	3/4	VIT	IBS	IBS	Dis	Dis	QPSK	CNT
23	1024	16/15	1/2	VIT	IBS	IBS	Dis	Dis	QPSK	IBS
27	1024	16/15	3/4	VIT	IBS	IBS	Dis	Dis	QPSK	IBS
29	1536	16/15	3/4	VIT	IBS	IBS	Dis	Dis	QPSK	IBS
30	1088	16/15	1/2	VIT	IBS	IBS	Dis	Dis	QPSK	IBS
39	1088	16/15	3/4	VIT	IBS	IBS	Dis	Dis	QPSK	CNT
43	1152	16/15	1/2	VIT	IBS	IBS	Dis	Dis	QPSK	CNT

46	1152	16/15	3/4	VIT	IBS	IBS	Dis	Dis	QPSK	CNT
51	1216	16/15	1/2	VIT	IBS	IBS	Dis	Dis	QPSK	CNT
53	1216	16/15	3/4	VIT	IBS	IBS	Dis	Dis	QPSK	CNT
54	1280	16/15	1/2	VIT	IBS	IBS	Dis	Dis	QPSK	CNT
57	1280	16/15	3/4	VIT	IBS	IBS	Dis	Dis	QPSK	CNT
58	1344	16/15	1/2	VIT	IBS	IBS	Dis	Dis	QPSK	CNT
67	1408	16/15	1/2	VIT	IBS	IBS	Dis	Dis	QPSK	CNT
71	1408	16/15	3/4	VIT	IBS	IBS	Dis	Dis	QPSK	CNT
75	1472	16/15	1/2	VIT	IBS	IBS	Dis	Dis	QPSK	CNT
77	1472	16/15	3/4	VIT	IBS	IBS	Dis	Dis	QPSK	CNT
78	1600	16/15	1/2	VIT	IBS	IBS	Dis	Dis	QPSK	CNT
83	1600	16/15	3/4	VIT	IBS	IBS	Dis	Dis	QPSK	CNT
85	1664	16/15	1/2	VIT	IBS	IBS	Dis	Dis	QPSK	CNT
86	1664	16/15	3/4	VIT	IBS	IBS	Dis	Dis	QPSK	CNT
89	1728	16/15	1/2	VIT	IBS	IBS	Dis	Dis	QPSK	CNT
90	1728	16/15	3/4	VIT	IBS	IBS	Dis	Dis	QPSK	CNT
92	1792	16/15	1/2	VIT	IBS	IBS	Dis	Dis	QPSK	CNT
99	1792	16/15	3/4	VIT	IBS	IBS	Dis	Dis	QPSK	CNT
101	2048	16/15	3/4	VIT	IBS	IBS	Dis	Dis	QPSK	IBS
102	1856	16/15	1/2	VIT	IBS	IBS	Dis	Dis	QPSK	CNT
105	1856	16/15	3/4	VIT	IBS	IBS	Dis	Dis	QPSK	CNT
106	2048	16/15	3/4	VIT	IBS	IBS	Dis	Dis	QPSK	CNT
120	1544	965/1024	3/4	VIT	IBS	IBS	Dis	Dis	QPSK	IBS
135	1984	16/15	1/2	VIT	IBS	IBS	Dis	Dis	QPSK	CNT
139	1984	16/15	3/4	VIT	IBS	IBS	Dis	Dis	QPSK	CNT
45	3088	1	1/2	VIT	NONE	V.35 (IESS)	Dis	Dis	QPSK	CNT
141	3088	1	3/4	VIT	NONE	V.35 (IESS)	Dis	Dis	QPSK	CNT
176	4000	1	1/2	VIT	NONE	V.35 (IESS)	Dis	Dis	QPSK	CNT
116	4000	1	3/4	VIT	NONE	V.35 (IESS)	Dis	Dis	QPSK	CNT
60	1344	16/15	3/4	VIT	IBS	IBS	Dis	Dis	QPSK	CNT



## G.2 Sample Applications

The following section provides brief application notes for operating the modem and explains by example how to configure the modem for some of the most popular configurations.

The following information illustrates the allowable combinations for Mode and Data Rate.

Allowable Combinations: Mode/Rate/Framing.

### IDR:

8.448 Mbps	3/4, 7/8 Rate FEC
6.312 Mbps	1/2, 3/4, 7/8 Rate FEC
2.048 Mbps	1/2, 3/4, 7/8 Rate FEC
1.544 Mbps or Below	1/2, 3/4, 7/8 Rate FEC

### IBS:

2.048 Mbps or below	1/2, 3/4, 7/8 Rate
---------------------	--------------------

### Closed Network:

8.448:	96 Kb Framing or No Framing, 3/4, 7/8 Rate FEC
6.312:	96 Kb Framing or No Framing, 1/2, 3/4, 7/8 Rate FEC
2.048:	96 Kb Framing or 1/15 Framing or No Framing, 1/2, 3/4, 7/8 Rate FEC
1.544:	96 Kb Framing or 1/15 Framing or No Framing, 1/2, 3/4, 7/8 Rate FEC
Any Rate 2.048 & lower:	1/15 Framing or No Framing, 1/2, 3/4, 7/8 Rate FEC

### G.2.1 Operational Case Examples



#### NOTE

*For best results always begin setup by setting the data rate to 512 Kbps. This data rate is applicable for all modes and as such provides a convenient launch point for setting up the modem. Any mode of operation can be entered from this starting point.*

**Case 1: IDR 8.448 Mbps, 3/4 Rate Viterbi**

Starting with the Data Rate = 512 Kbps

**Modulator:****Method 1 -**

Under Interface Menu:

Set Interface type  
Set Tx clock selection

Set mode to IDR

Under Mod Data Menu:

Set code rate to 3/4 VIT  
Set data rate for 8448000

Under Mod IF Menu: Set desired Tx frequency and power level  
Turn IF ON

**Method 2 -**

Under Interface Menu:

Set Interface type  
Set Tx clock selection

Set Mod strap code to: 128

Under Mod IF Menu: Set desired Tx frequency and power level  
Turn IF on

**Demodulator:****Method 1 -**

Under Interface Menu:

Set Interface type  
Set Buff clock selection  
Set Buffer Size

Set mode to IDR

Under Demod IF Menu: Set desired Rx frequency

Under Demod data Menu:

Set code rate to 3/4 VIT  
Set data rate for 8448000

**Method 2 -**

Under Interface Menu:

Set Interface type  
Set Buff clock selection  
Set Buffer Size

Set Demod strap code to 128

Under Demod IF Menu, set desired Rx frequency

**Case 2: IBS 1.544 Mbps, 3/4 Rate Viterbi**

Starting with the Data Rate – 512 Kbps

**Modulator:****Method 1 -**

Under Interface Menu:

Set Interface type  
Set Tx clock selection

Set Framing to 1/15

Set mode to IBS

Under Mod Data Menu:

Set code rate to 3/4 VIT  
Set data rate for 1544000

Under Mod IF Menu: Set desired Tx frequency and power level  
Turn IF ON

**Method 2 -**

Under Interface Menu:

Set Interface type  
Set Tx clock selection

Set Mod strap code to: 120

Under Mod IF Menu: Set desired Tx frequency and power level  
Turn IF on

**Demodulator:****Method 1 -**

Under Interface Menu:

Set Interface type  
Set Buff clock selection  
Set Buffer Size

Set Framing to 1/15:

Set mode to IBS:

Under Demod IF Menu: Set desired Rx frequency

Under Demod Data Menu:

Set code rate to 3/4 VIT  
Set data rate for 1544000

Under Interface Menu:

Set Interface type  
Set Buff clock selection  
Set Buffer Size

**Method 2 -**

Under Interface Menu:

Set Interface type  
Set Buff clock selection  
Set Buffer Size

Set Demod strap code to: 120

Under Demod IF Menu: Set desired Rx frequency

**Case 3: Closed Network, 3/4 Rate Viterbi, IBS Overhead**

Starting with the Data Rate = 512 Kbps

**Modulator:****Method 1 -**

Under Interface Menu:

Set Interface type  
Set Tx clock selection

Set mode to IDR:

Under Mod Data Menu:

Set code rate to 3/4 VIT  
Set Framing for 1/15

Under Mod IF Menu: Set desired Tx frequency and power level  
Turn IF ON

**Method 2 -**

Under Interface Menu:

Set Interface type  
Set Tx clock selection

Set Mod strap code to: 101

Under Mod IF Menu: Set desired Tx frequency and power level  
Turn IF on

**Demodulator:****Method 1 -**

Under Interface Menu:

Set Interface type  
Set Buff clock selection  
Set Buffer Size

Set mode to: Closed Net

Under Demod IF Menu: Set desired Rx frequency

Under Demod data Menu:

Set code rate to 3/4 VIT  
Set Framing for 1/15

**Method 2 -**

Under Interface Menu:

Set Interface type  
Set Buff clock selection  
Set Buffer Size

Set Demod strap code to: 101

Under Demod IF Menu: Set desired Rx frequency

**Case 4: Loop Timing Example****Method 1 -**

Under Interface Menu:

Under Tx Setup Menu:

Set INTF to RS-422

Set SCT Source to SCR

Set Tx Clock to SCTE

Set mode to IBS

**Method 2 -**

Under Interface Menu:

Under Tx Setup Menu:

Set INTF to RS-422

Set SCT Source to SCR

Set Tx Clock to SCTE

Set mode to Closed Net

**Notes:**

[illegible]

# Appendix H. AUPC Operations

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## H.1 Automatic Uplink Power Control (AUPC Operation)

The modem has an optional built-in provision for Automatic Uplink Power Control, AUPC. AUPC is useful when operating power levels are affected by environmental changes in the atmosphere. AUPC attempts to adjust local power output to maintain a constant  $E_b/N_o$  at the receiver location.

The modem supports three versions of AUPC. They include Radyne AUPC, EF AUPC and Near Side AUPC. Radyne AUPC and EF AUPC use satellite overhead to send messages between the local and remote ends of an SCPC link. The messaging is done with IBS 1/15 and EF AUPC Framing messages.

### H.1.1 Radyne AUPC

In this case, Target  $E_b/N_o$  indicates the remote value the local unit wants to maintain by adjusting the local power level.

Radyne AUPC can be set to operate on either or both directions of a link but always require a bi-directional channel. Enabling AUPC on one side of the link will activate AUPC on the distant end of the link. It is necessary that both the Modulator and Demodulator be set to the appropriate framing for AUPC options to be editable and for the AUPC function to operate properly.

Examples of the basic Radyne AUPC Operations are described as follows:

Assume that the two modems, one at each end of the link, are set to Radyne AUPC operation. Only one direction is discussed, but the same functions could be occurring in both directions simultaneously.

Local Modem is transmitting to Remote modem under normal conditions and the Remote modem has a receive  $E_b/N_o$  of 7.5 dB. Local modem has been set to a Target  $E_b/N_o$  of 7.5 dB with an output power level of -30 dBm.

It begins raining at Remote site and the  $E_b/N_o$  drops to -7.0 then -6.8 dB. Remote Modem is constantly sending update messages of its  $E_b/N_o$  to Local modem. When Local modem sees the

drop in the remote  $E_b/N_o$ , it slowly begins to raise the output power, and will continue to adjust if the remote  $E_b/N_o$  continues to drop. As the rain increases in intensity, the remote  $E_b/N_o$  decreases but Local modem continues to increase its power level to compensate.

When the rain diminishes, Local modem will see the remote  $E_b/N_o$  begin to increase. Local modem will lower its power level. The operation is therefore a feedback control loop with the added complication of a significant time delay.

## H.1.2 EF AUPC

In EF AUPC mode, the Target  $E_b/N_o$  indicates the local unit wants the remote unit to maintain a power level sufficient to provide the local  $E_b/N_o$  value.

EF AUPC can be set to operate on either or both directions of a link but always require a bi-directional channel. Enabling AUPC on one side of the link will activate AUPC on the distant end of the link. It is necessary that both the Modulator and Demodulator be set to the appropriate framing for AUPC options to be editable and for the AUPC function to operate properly.

Examples of the basic EF AUPC Operations are described as follows:

Assume that the two modems, one at each end of the link, are set to AUPC operation. Only one direction is discussed, but the same functions could be occurring in both directions simultaneously.

The local modem is transmitting to modem at a remote locale under normal conditions. The remote modem has a receive  $E_b/N_o$  of 7.5 dB. The local modem has been set with a Target  $E_b/N_o$  of 7.5 dB, and has a current power output of -30 dBm.

It begins to rain at the local site, and the  $E_b/N_o$  drops to -7.0 then -6.8 dB. The local modem is constantly sending update messages of its  $E_b/N_o$  to the remote modem. When the remote modem sees the drop in the  $E_b/N_o$ , it slowly begins to raise its output power, and will continue to do so until the Target  $E_b/N_o$  is restored at the local site.

When the rain diminishes, the local modem's  $E_b/N_o$  will begin to increase. The remote modem will now lower its power level to restore the target value. The operation is therefore a feedback control loop with the added complication of a significant time delay.

## H.1.3 Near Side AUPC

Near Side AUPC is a loop back system that adjusts the broadcast uplink signal when local conditions change. This is done by having the Near Side AUPC attempt to adjust the outbound power to compensate for local weather.

The local receiver must be tuned and locked to the transmitter and then the internal  $E_b/N_o$ , is used for feedback. This creates a Tx-Satellite-Rx control loop.

Near Side AUPC is primarily used for broadcast applications since the modem cannot expect to receive data from a distant location. Near Side AUPC can be utilized with any satellite framing or Network mode.



There are safeguards built into the AUPC System. First, the modulator has two parameters, which allow control of the maximum and minimum output power Levels. Second, a nominal, or default, power level is specified which takes effect if the receive signal or messaging is lost. This nominal power should be set to a level high enough to re-establish communications regardless of rain fade.

EF AUPC, also provides some control over the rate of power change; while the Radyne and Near Side AUPC use a optimized rate for rain fade compensation.

The AUPC Menu Functions and their descriptions are shown on Table H-1 and H-2.

<b>Table H-1. Local AUPC Functions</b>		
<b>Function</b>	<b>AUPC Available Options</b>	<b>Description</b>
AUPC MODE	DISABLE, NEARSIDE, RADYNE, EFDATA	Enables/Disables the AUPC to function locally
NOMINAL POWER	-20 TO -45 dB	Sets default output power to be used
MINIMUM POWER	-20 TO -45 dB	Sets minimum output power to be used
MAXIMIM POWER	-20 TO -45 dB	Sets maximum output power to be
TARGET Eb/No	4.0 TO 16 dB	Desired $E_b/N_0$ of remote modem
TRACKING RATE	6.0 to 0.5 dB/MIN	Adjustable in .5dB increments
LOCAL CL ACTION	HOLD, MAXIMUM, NOMINAL	Allows user to determine what power setting the remote modem will use in the event of a carrier loss at the local side.
REMOTE CL ACTION	HOLD, MAXIMUM, NOMINAL	This setting allows users to determine what local output power setting to use in the event that the remote end has a carrier loss.
<b>1. The AUPC Menus are located under the Modulator Menu as shown in Section 4.</b> <b>2. The EF AUPC Menu displays when EFAUPC Framing is enabled in the Demod and Mod set up menus.</b> <b>3. Highlighted areas are activated when modem is set to EF AUPC</b>		

<b>Table H-2. Remote AUPC Functions (EF AUPC Only)</b>		
<b>Function</b>	<b>AUPC Available Options</b>	<b>Description</b>
AUPC MODE	Disable, EFDATA	Enables/Disables the AUPC to function remotely
LOOPBACK	Enabled/Disabled	Loop back test over satellite link
TX 2047 TEST BER	Enabled/Disabled	Initiates 2047 Test pattern BER Test
RX 2047 BER	Status Menu	Identifies the BER status on the distant RX side
AUPC DEF LVL		Sets default output power to be used
<b><i>The Remote AUPC Menus are only supported by EFAUPC</i></b>		

**Notes:**

[illegible]

## METRIC CONVERSIONS

### Units of Length

Unit	Centimeter	Inch	Foot	Yard	Mile	Meter	Kilometer	Millimeter
1 centimeter	—	0.3937	0.03281	0.01094	$6.214 \times 10^{-6}$	0.01	—	—
1 inch	2.540	—	0.08333	0.2778	$1.578 \times 10^{-5}$	0.254	—	25.4
1 foot	30.480	12.0	—	0.3333	$1.893 \times 10^{-4}$	0.3048	—	—
1 yard	91.44	36.0	3.0	—	$5.679 \times 10^{-4}$	0.9144	—	—
1 meter	100.0	39.37	3.281	1.094	$6.214 \times 10^{-4}$	—	—	—
1 mile	$1.609 \times 10^5$	$6.336 \times 10^4$	$5.280 \times 10^3$	$1.760 \times 10^3$	—	$1.609 \times 10^3$	1.609	—
1 mm	—	0.03937	—	—	—	—	—	—
1 kilometer	—	—	—	—	0.621	—	—	—

### Temperature Conversions

Temperature	° Fahrenheit	° Centigrade
Water freezes	32	0
Water boils	212	100
Absolute 0	-459.69	-273.16

Formulas
$^{\circ}\text{C} = (\text{F} - 32) * 0.555$
$^{\circ}\text{F} = (\text{C} * 1.8) + 32$

### Units of Weight

Unit	Gram	Ounce Avoirdupois	Ounce Troy	Pound Avoirdupois	Pound Troy	Kilogram
1 gram	—	0.03527	0.03215	0.002205	0.002679	0.001
1 oz. avoird.	28.35	—	0.9115	0.0625	0.07595	0.02835
1 oz. troy	31.10	1.097	—	0.06857	0.08333	0.03110
1 lb. avoird.	453.6	16.0	14.58	—	1.215	0.4536
1 lb. Troy	373.2	13.17	12.0	0.8229	—	0.3732
1 kilogram	$1.0 \times 10^3$	35.27	32.15	2.205	2.679	—



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